

# The Science News of 2011

(extracts of the non-award winning blog from the internet)



By Thomas Dickinson

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# Biology

# Primordial Soup – 17/03/11

Creationists use the complexity of molecules found ubiquitously on Earth as an argument to support creationism, citing that such complexity could not have occurred naturally as the odds are so long.

In early Earth, there were pools of liquid containing dissolved gases, nutrients and other random atoms. These have now been dubbed "primordial soups". The random collisions between some of these atoms sometimes created a more energetically stable compound. Being more energetically stable is advantageous for molecules/ compounds because they are favoured by the environment, meaning they were able to stay in the environment until living organisms came around and were able to incorporate them by endosymbiosis. The useful compounds that were taken up by the organism were made a permanent fixture in the organisms over evolutionary time by natural selection.

Creationists will tell you that the probability of incredibly complex molecules like DNA, amino acids or huge carbohydrates being made by the random joining together of atoms that just happened to be in the same part of the same pool on the same day AND made an energetically favourable molecule are astronomically small. However, the odds of winning the lottery are over 14,000,000 to 1. These are almost incomprehensibly small odds, but someone wins nearly every week. Over half a billion years or more, with all of the reactions that can happen in that time and the constantly changing make up of each of the thousands and thousands of pools, a great deal of those reactions would have created useful and something that would not be dissimilar to molecules and compounds that are all around us and part of us today.

Just remember, at least one person wins the lottery every week it is played in every country around the world.

# Saber-Toothed Vegetarian – 25/03/11

The remains of a saber-toothed vegetarian have been found in modern-day Brazil. The animal was about the same size as a large dog and had 5 inch upper canine teeth.

Unlike other saber-toothed animals of old, *Tiarajudens eccentricus* did not use the teeth for killing prey, but most likely used them for protecting territory or attracting females.

*Tiarajudens eccentricus* was part of a group called anomodonts, which were mammal-like reptiles. The discovery of such an uncommon evolutionary feature was described as “extraordinary” by Joerg Froebisch, who was not part of the original research team, headed by Juan Carlos Cisnero, from the University of Piaui (North East Brazil).

Discoveries like this go to highlight how diverse and creative evolution has been, and how nature has found new ways of getting around problems faced by organisms around the world throughout all of time.

# STD = Sight Test by Ducks – 13/04/11

New research suggests that female ducks distinguish between male ducks with STDs and sexually healthy ones.

Dr Melissa Rowe, from the University of Oslo, found that the semen of ducks with more colourful bills had higher levels of effective antibacterial sperm, which can kill bacteria such as *E. coli*, which can damage the male's sperm.

It is suggested that females use the colour of male's bills to determine which male to mate with to avoid STDs. Previous studies had shown that female ducks chose their mate based on the colour of their bill, but the reasoning was not understood.

Amazingly, distinguishing between possible mates based on their sexual health has previously been shown in crabs, insects and mammals.

The female duck is choosing not only the healthiest male, but also the evolutionarily stronger one who would provide strong, healthy offspring – essential for their survival.

Source:

[http://news.bbc.co.uk/earth/hi/earth\\_news/newsid\\_9454000/9454586.stm](http://news.bbc.co.uk/earth/hi/earth_news/newsid_9454000/9454586.stm)

# Stem Cell Research Funding Ban in USA Lifted – 09/05/11

A high ranking court in Washington DC has ruled that research into human embryonic stem cells can be funded by the National Institutes of Health (NIH), after an injunction was overturned.

In August 2010, a lower court temporarily stopped funding the work, while debating whether to permanently stop the government from funding stem cell research.

The two researchers that are in the centre of this case are James Sherley and Theresa Diesher. The judge of the US district court of Washington DC claimed that Sherley and Diesher are in violation of something called the Dickey-Wicker Amendment. This prohibits the government from funding research which destroys or discards human embryos. However, it does not stop NIH (a government agency of the department of health and human sciences) from funding research into human stem cells, as long as the money does not come from federal funds. It will be hard for the lower-court judge to proceed with the same argument as before.

If you don't already know what stem cells are, here is a very brief summary. Cells that are found in the eye as light receptors, in the intestine absorbing food or in nerves conducting electricity all have very different functions but all start out as the same cells; stem cells. These are found around the body in tissues to replace cells in that part of the body. If stem cells don't remain as stem cells, they

differentiate into their particular type (“eye cells” or “heart cells”), and there is no going back. They will be that type of specialised cell until they die. Stem cells have the ability to divide without limit and have the incredible ability to be forced to grow into any type of cell, given the correct stimuli in a lab. This holds great prospects for the future of organ replacement and repair. But as with any research, the money needs to be in place to fund work into stem cells to improve therapies, and therefore the quality of life for the patient afterwards.

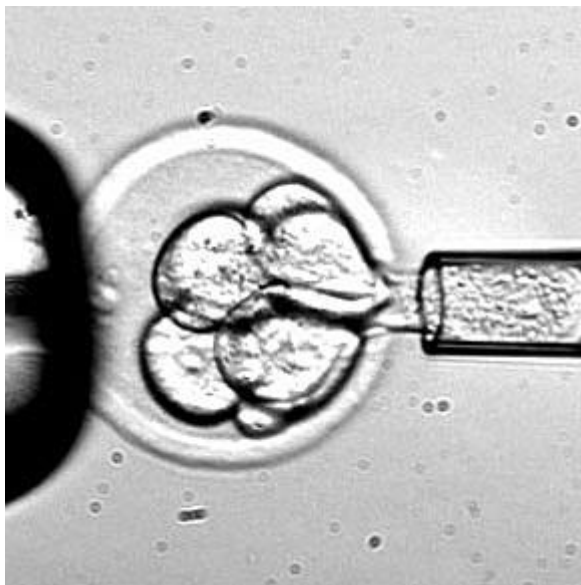


Image: <http://www.sciencemuseum.org.uk/antenna/stemcellbasics/>

Source: <http://www.nature.com/news/2011/110503/full/473015a.html>

Video: <http://www.youtube.com/watch?v=TRtlkcQ6brE>



# Foundations of Mammalian Evolution –

## 20/05/11

Developing a good sense of smell may have been the cause of the development of large brains in mammals.

Researchers compared the internal anatomy of two premammals and two of the earliest known mammals. They discovered that the biggest difference between them were the over-developed areas which perceive smells.

Developing a large brain will have enabled these earliest mammals to hunt at night, and therefore have a massive advantage over their prey and other predators. Most of the paleontological research on mammalian evolution until now has been focused on the development of feeding and hearing to aid hunting.

These findings were published in *Science* by Rowe in the same issue as an accompanying article from Glenn Northcutt, who was not part of Rowe's team. The accompanying article hailed Rowe's discovery as providing "the first solid evidence of the stages in mammalian brain evolution."

# Artificial Leafs – 22/05/11

Scientists from around the world have taken inspiration from nature and designed an artificial leaf which would use photosynthesis to produce an alternative fuel source using only carbon dioxide, water and sunlight.

Even though the mechanism of producing energy will be based on how real leaves work, the artificial leaves won't look like the real article. They will probably cover a field and absorb light and water vapour.

The federal Department of Energy awarded the five-year grant of up to \$122 million to Nathan S. Lewis a Chemistry Professor at California Institute of Technology and the leader of the research into the design and production of the artificial leaf.

This is not a new idea. Previous attempts to make artificial leaves have produced prototypes that are too inefficient, too expensive or too fragile to break the monopoly of the fossil fuel industry. He hopes that all three of these issues can be addressed to make the prototype of a commercially viable product in the next five years.

Daniel Nocera, of MIT, is the creator of one type of artificial leaves. His hope is that they will be on rooftops as to make "each homes its own power station". At the minute though, his design and the technology in it (a silicon membrane layered with catalysts that break down water into hydrogen on one side and oxygen on the other) would not be able to power the average American home. His design does however lack extensive wiring and extensive

membrane, which are both advantages. This way he can collect the hydrogen as fuel instead of breaking down sunlight directly into current. Another advantage is that the water used does not need to be pure, as in nature.

This design would be used on a smaller scale, such as on top of houses in developing nations, where they may need to use the energy where it is collected; another advantage of this design.

Nocera says that his company that is designing and producing these leaves are “well beyond the science and into the engineering and reliability”.

Technology like artificial leaves will help to bring an end to our unsustainable use of fossil fuels and help move into an age of renewable energy, which can only be a good thing.

Source:

[http://www.nytimes.com/2011/05/22/business/22novel.html?\\_r=1&ref=science](http://www.nytimes.com/2011/05/22/business/22novel.html?_r=1&ref=science)

# Reading Your Mind – 10/06/11

You will not have a problem reading these paragraphs as researchers at Cambridge University have found that the brain can understand messages up words.

As long as the first and last letters are in the right place, the middle letters can be in any order. This is because the human brain reads the word as a whole, and not just individual letters.

Pretty impressive isn't it?

# Uterus Transplant – 14/06/11

Mayer Rokitansky Kuster Hauser (MRKH) syndrome affects 1 in every 4500 females in the U.S. and causes abnormalities in the female reproductive system.

Sara Ottoson, 25, has MRKH and was born without a uterus. Her mother Eva, 56, intends to donate her womb to her daughter. If Sara then became pregnant, she would be carrying her baby in the same womb as she was. Eva and Sara are being rational about the situation and describing the procedure like any other organ transplant. Eva has an organ she no longer needs and Sara needs one if she is going to have her own child. The only other widely reported uterus transplant was performed in Saudi Arabia in 2000, but had to be removed 99 days later due to complications.

If it proves successful, it could be a possible solution to other women who have problems with their uterus whether they have MRKH syndrome or not.

# Baker's Yeast as LSD factory – 21/06/11

A team from Harvard University have announced that they will be able to produce LSD by adding biological pathways to the same yeast that baker's use for their bread. Approximately 20 tonnes of lysergic acid is used every year in the production of medicines such as nicergoline, which is a treatment for dementia. Lyseric acid is also a precursor to producing LSD.

The ergot fungus produces a whole host of molecules from lysergic acid naturally, and after processing the fungus in vats, the crude drug is extracted for purification.

Jake Wintermute addressed the Synthetic Biology 5 conference at Stanford University last week and announced that by adding biological pathways found naturally in the fungus to baker's yeast, which produces rapid results, he will be able to produce "organic" LSD. He has already added two of the six pathways required. Once the drug is made in the yeast, it should be able to leave the cells and be collected and refined into pure LSD. Wintermute made an estimate at one litre of modified yeast producing one gram of lysergic acid, which can then go on to create LSD, or other molecules.

This is not the start of commercialised LSD manufacturing though. Wintermute hopes that smarter, more targeted drugs for dementia could be created using this technique of exploiting the yeast's machinery.

Source: <http://www.guardian.co.uk/science/blog/2011/jun/21/scientists-make-lsd-from-microbes>

# Newly Discovered Fungus is SpongeBob SquarePants – 22/06/11

A newly discovered fungus has been named SpongeBob SquarePants by scientists at San Francisco State University.

Unlike its namesake, the fungus does not live in a pineapple under the sea, it was found in the rainforests of Borneo. The bright orange fungus was found in Lambir Hills National Park on the tropical island in Malaysia. Its scientific name is *Spongiforma* (representing its likeness to sea sponges) *squarepantsii* (the Latinisation of the cartoon's surname).

SpongeBob SquarePant's unusual name is just the start. The internal structure, deciphered by scanning electron microscopy, of the mushroom resemble a sponge. What's more, water can be wrung from it when soaked and it will return to its original size, like a sponge. DNA analysis also shows that the mushroom's closest relative is found thousands of miles away in the forests of Thailand.

The researchers suggest that SpongeBob SquarePants lost its classical stem and cap mushroom shape some time ago. The shape of other mushrooms is an evolutionary advantage as it raises the spores off the ground, meaning they can be more effectively dispersed over a wider area by wind or animals. The cap also protects the spores from drying out. Rainforests are humid though so *Spongiforma* mushrooms, like SpongeBob SquarePants' relative, lost the stem and cap shape because the spores would not dry out in the rainforest.

An estimate puts the number of fungal species in Earth at between 1.5 and 3 million, with only 5% of them defined so far. This means the ecosystems they are found in are more complex than previously thought.

Source: <http://www.guardian.co.uk/science/punctuated-equilibrium/2011/jun/22/2>



# Guerilla Science at Glastonbury

A group called Guerilla Science brought the stark reality of the human body's bacterial residents to the unsuspecting crowd at this year's Glastonbury festival. They put a Microbial Zoo on display to show some of the thousands of species that live inside all of us. Festival-goers who entered the decontamination area were surprised to find that 1kg of bacteria live in their gut alone and that there are ten times as many bacterial cells in our body as there are our own cells.

UV paint was pasted onto all those who entered, who then wandered around the maze inside the big white cube, Shangri-La that hosted the event. The participants were then "cleansed" in one of a number of ways, after a microbiology lesson.

They had the choice to be physically disinfected or moral disinfected. Physical "disinfection" included undressing (some got completely naked) and then they entered a strobe-lighten shower. The moral "disinfection" included a session with a real psychiatrist, for as long as was required to rest their legs on the leather couch and talk to the doctors. This room then lead to the Shame Drain, where they confessed a secret anonymously to a microphone that was hooked up to speakers outside the decontamination unit.

Dr Methuen, one of the psychiatrists, was surprised how many people took to the Shame Drain and found confessing to be a "cleansing experience" in itself. She

believes that there is still negative stereotyping of psychotherapy and having the chance just to sit down with someone and ask them how they are is therapeutic in itself in the craziness of Glastonbury.

Introducing basic and relevant science to the masses can only be a good thing and using a place like Glastonbury for that message is a great way to start making science more accessible to more people.



Image: <http://tinyurl.com/6c34fn2>

Source: <http://www.guardian.co.uk/science/blog/2011/jun/30/dirt-nudity-tears-glastonbury>

# Darwin's scribbling reveals the evolution of Evolution – 04/07/11

A collection of Charles Darwin's personal books have been made digitally available online and the pencil notes in the margin reveal his thoughts about his theory.

He did not keep a diary in the months immediately after his voyage on HMS Beagle, but made notes in the margins of books he read, regarding his own hitherto half-baked theory. This allowed him to develop his theory and provides a new insight into his thoughts prior to the publication of *The Origin of Species*.

His mentors Henslow and Lyell published books on Darwin's return. Darwin began reading their work and was not afraid to challenge them, on paper at least.

Darwin also disagreed with Lamarckian evolution theory which stated that an animal can change characteristics in a single lifetime and pass those changes on to their offspring. He wrote on the back page of Lamarck's book: "If this were true adios theory." On the back page of Henslow's book, Darwin writes: "People constantly speak about every organism being...perfectly adapted to circumstances if so how can there be a rare species breeding power being efficient". This shows his break with Henslow's theory, which stated that God created animals and set them in an ideal environment.

Darwin's collection was not restricted to scientific books; he also read a philosophical book by John Abercrombie about human intelligence, in which he gave his

critique of materialism. In the margin, Darwin has wrote "Will my theory apply here?" and "If I pursue my theory, am I plunging into badness?"

The Darwin Manuscripts Project is being presented at the American Museum of Natural History.

People constantly speak about  
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rate <sup>per</sup> ~~one~~ breeding power being  
efficient & <sup>it sufficient</sup> ~~in the country~~  
~~probably~~ abundant is there

Image: <http://tinyurl.com/68a6f4w>

Source: <http://www.wired.com/wiredscience/2011/06/darwin-marginalia/?pid=1545>

# A half male, half female butterfly has been unveiled at the London National History Museum – 12/07/11

The gynandromorph butterfly has different length antenna and different wing colourings, which alerted the staff at the museum's butterfly exhibition. The reproductive organs of the great mormon butterfly had fused down the middle, resulting in one black wing on the male side and a paler wing on the female side, along with fused male and female reproductive organs in the middle.

Gynandromorphy occurs when the separation of sex chromosomes fails as the cells divide during the development in the chrysalis. Lobsters, crabs, and other insects can also be born gynandromorphs. Around one in ten thousand butterflies are born this way, but probably go unnoticed as the male and females are often the same colour. The butterfly is flying and eating normally and is expected to have a normal life-expectancy of one month.

The butterfly will become part of the Lepidoptera collection after the Sensational Butterfly Exhibiton has finished at the Nation History Museum in September.

# Newt's Eye Regeneration – 12/07/11

Newt's ability to regenerate lost limbs has fascinated scientists, including Charles Darwin, since 1768 when Lazzarro Spallanzani discovered the phenomenon.

A research team from the Centre for Tissue Regeneration and Engineering in Ohio has spent 16 years removing the lens from the eye of Japanese Newts 18 times to determine whether their ability diminished over time. They found that the quality of the 17<sup>th</sup> and 18<sup>th</sup> lenses and the speed at which they were produced, were “virtually identical” to the first ones. They showed no difference in structure or expressions of genes known to be important in eye homeostasis or the development of the lens.

The experiments were stopped as the newts were coming to the end of their lifespan; however Panagiotis Tsonis, who conducted the research, believes the newts could continue regenerating lenses for their whole life. The regeneration of organs in newts could hold the mechanism by which human organs could be regenerated as treatments for many diseases.

It was thought that as the newts got older, their ability to regenerate organs would not become as effective. The independent relationships of regeneration and aging is very interesting and could possibly help to treat human diseases regardless of the age of the patient, as researchers attempt to create a mammalian tissue regeneration.

Source:

[http://blogs.nature.com/news/2011/07/from\\_cynops\\_to\\_cyclops\\_and\\_bac.html](http://blogs.nature.com/news/2011/07/from_cynops_to_cyclops_and_bac.html)

The Home Office have released the data regarding the number of animals used in experiments in 2010.

An increase of approximately 100,000 procedures were recorded from 2009 to 2010,, making the total number of procedures in the region of 3.7 million. This is an overall increase of 1%.

Importantly for animal rights protestors, the increase in procedure number is not the same as the increase in the number of animals used. The act of breeding a genetically modified animal counts as a procedure, as does any of the procedures carried out on that one animal.

In the same period, the numbers of fish went up by 23% to about 93,000 animals. This, says Judy McArthur Clark, the chief inspector at the Animal Scientific Procedures Inspectorate of the Home Office, means “there’s an accompanying decrease in other species [used].”

Using fewer numbers of animals for more procedures highlights the advances and refinement in techniques used in genetic manipulation of animals. By keeping

two unaffected adults of the opposite sex, and allowing them to breed to create an affected infant, allows the numbers of adversely affected animals to be kept to the bare minimum.

This means the correct number of animals, which are adversely affected by their change in genetics, are born and therefore there is minimum wasting of animals.

It is important to point out as well that primates and larger mammals like cats, dogs and horses are protected by miles of red-tape by the law, preventing all but what is

deemed essential research to be carried out on them. Most of the procedures on these types of animals is collecting blood and tissue samples used in pharmaceutical research and development departments.

An 11% fall in toxicological tests was also recorded as more tests can be undertaken to satisfy the terms of the regulations in place.

As the head of the Biomedical School at King's College London, Professor Morris, points out, diseases are of the whole body and studying individual cells or molecules can only get researchers so far. Many diseases are multi-step and multi-organ, relying on complex interactions and relationships between different cell types, meaning that the most representative research needs to be done on animals so we have a better understanding of these diseases and a better idea about how to prevent and cure them.



Source:

<http://www.guardian.co.uk/science/2011/jul/13/animal-experiments-rise>

Image:

<http://tinyurl.com/6xtpte2>



# Cloning Wildcats – 25/08/11

A member of the team behind cloning Dolly the Sheep back in 1996 has started work to clone rare Wildcats. The number of Wildcats is thought to be around 400, and attempts to increase their number by cloning have previously been suggested by the Royal Zoological Society of Scotland.

Inter-breeding with domestic cats is one of the reasons the wild numbers have dwindled, however, the domestic cat could provide the answer.

Because the Wildcat crosses with domestic cats, it is hard to find a pure bred. However, scientists have been able to use domestic cats to clone other species. Similarly, dog eggs have been used to clone wolves. Only Wildcat skin cells would be needed for the cloning process in addition to the eggs of a domestic cat.

In the Cairngorms, domestic cats are sprayed to prevent them breeding with Wildcats, and this could provide a suitable source of eggs to be used in the cloning procedure.

The RZSS's Highland Wildlife Park stated that a hybrid of housecat/wildcat could give birth to pure breed wildcats. This, it is hoped, would help boost the numbers of the 150 breeding pairs that survive in the highlands.

# Coral Sunscreen – 31/08/11

Coral's natural defence to protect them from the sun's UV rays are being studied in the hope of providing a sunscreen tablet for humans to protect ourselves.

Dr Paul Long and his team from King's College London studied the genetic and biochemical properties of the endangered *Acropora* coral in the Great Barrier Reef. By understanding these, the team hope to be able to produce a synthetic version of the natural sunscreen component.

The relevant area of the coral genome will be replicated and inserted into bacteria which will then be able to produce large amounts of the sunscreen in a fraction of the time. It is thought that fish that feed on the *Acropora* coral also benefit from the UV protection provided by the coral.

Before the team look to making a tablet, they plan to produce a lotion containing the same ingredient and test it on human skin that has been cut off cosmetic surgery patients.

An unrelated project by funded by the Biotechnology and Biosciences Research Council is looking at using the same component to protect equatorial agriculture from the strong UV rays there.

# Clean Jeans – 12/09/11

UK textile manufacturers' latest collection of jeans uses nanotechnology to break down pollutants in the air around them.

Photocatalysts are added to the cloth in a process designed by Prof Tony Ryan MBE and Helen Storey MBE who are at the University of Sheffield and London College of Fashion, respectively. Thirty of the jeans are currently being “exhibited” in the Peace and Winter Gardens in Sheffield in “Field of Jeans”. The jeans are part of the University of Sheffield’s Faculty of Science’s “Project Sunshine”, which aims to combat climate change through using renewable sources of energy in practical everyday ways.

Ryan described the jeans as “technically excellent” while Storey stated that she tried to share and involve the public with the possibilities that science has to offer. After Friday 15<sup>th</sup>, the “field” moves to London until 21<sup>st</sup> September.

# Synthetic DNA Used To Evolve More Efficient Yeast Cells – 16/09/11

The use of synthetic DNA could be used to make organisms evolve on demand and result in more effective vaccines and better biofuels.

Jef Boeke and his team at Johns Hopkins University, made sections of the chromosome in the yeast species *Saccharomyces cerevisiae*, from scratch in the lab and transferred them into the yeast cells. After adopting the synthetic genetic material, these cells appear as healthy as the control cells with natural DNA.

This is a massive step forward in the goal to create a completely synthetic life form, which would be used to create huge amounts of biofuels and vaccines. Studies into synthetic animal life forms aims to determine what are the minimum set of genes needed for life on Earth.

The research uses a technique called Genome Scrambling, which means that when a chemical stimulus (in this case oestrogen) is introduced to the cells, it triggers a response which causes the rearrangement of the genes. This allows scientists to accelerate evolution in populations of organisms by creating thousands of different strains and seeing which ones survive. By analysing the sequencing data of those that survive, researchers can build up a picture of which genes are vital and which are not.

Forcibly evolving yeast cells in this way will allow industries that use them in the fermenting process (like vaccine, biofuel or alcohol production) to be more efficient and/or gain higher yields.

Source: <http://www.guardian.co.uk/science/2011/sep/14/synthetic-dna-in-yeast-breakthrough>

# Limitless Supply of Hydrogen from Bacteria Could Power the Future – 22/09/11

A microbial fuel cell which can in theory provide a limitless supply of hydrogen has gone on display at the London Science Museum.

The technology, pioneered by Bruce Logan (amongst others) in the US, uses naturally occurring bacteria which release electrons into the environment around them when they digest organic matter. Moving electrons is essentially what an electrical charge is. This ability is used inside a Microbial Fuel Cell to produce electricity. Only a little more power is needed to cause hydrogen gas to be made.

Up until now, hydrogen fuel has not lived up to its potential because an electrical source was needed to provide the energy to the system. This new technology gets around this problem by utilising the bacteria's natural flow of electrons. Water, salt water and some membranes is all that is needed to harness the electrical potential created by the bacteria. This is Reverse Electrodialysis, in which the electrical energy is gathered using the difference in salinity between the freshwater and the saltwater.

The authors of the paper are quick to point out that the technology is still in its early days, and for that reason, as well as the high costs making it commercially unviable, the technology may be a few years from being widely available. One way of making this happen would be to create large-scale cells to properly work out the costs. They conclude their paper by stating that this technology has “significant potential” to power our current standards of living, such as waste management, without using any fossil-fuel based electrical grid energy.

Source: <http://www.bbc.co.uk/news/science-environment-14976893>

# Artificial Cerebellum to Replace Damaged Brain Areas – 28/09/11

Brain damage in a rat has been restored after the implantation of an artificial cerebellum, moving us a step closer to replacing damaged areas of human brain tissue caused by strokes etc.

The cerebellum is concerned with the regulation and coordination of muscle activity, and is the latest area, after cochlear implants and prosthetic limbs, that can be made artificially, and such that the brain can interpret and process information from it. Matti Mintz of Tel Aviv University presented his work at a meeting in Cambridge this week, cited the relatively straightforward neuronal architecture of the region as one of the reasons why the cerebellum was a good area to synthesise.

After interpreting data input and outputs from a real cerebellum, the team mimicked the system on a chip, which is on top of the skull and connected to the brain using electrodes. They tested the chip by conditioning the anaesthetised rat to blink when a tone was sounded along with a puff of air on the eye. Once the rat has learned to respond without the air being blown onto its eye, they turned the artificial cerebellum off and the rat was unable to be conditioned in the same way. When the artificial cerebellum was reconnected, the rat behaved normally.

The team plan to model the technology on larger areas of the cerebellum to invoke a more complicated response and test the same theories in conscious animals.

Even though it is a basic response at the moment, it starts the journey towards more complicated responses and ultimately replacing damaged areas in humans.



Source: <http://www.newscientist.com/article/mg21128315.700-rat-cyborg-gets-digital-cerebellum.html>

Image: <http://tinyurl.com/6b8mlob>

# A Chimp With a Virtual Arm Demonstrates Possibility for Sensory Prosthetic Limbs – 06/10/12

A brain implant has been demonstrated to work in monkeys to not only control a virtual arm through thought alone, but also to receive tactile sensory information about texture.

Firstly, the monkeys used a joystick to manipulate a virtual arm on a computer screen and they were treated with a sip of fruit juice when they moved the “arm” over one of three identical shapes with a certain texture. After these tests, the brain implant, made of fine wires inserted into the motor cortex, was used to move the arm using thought alone. This involved between 50 – 200 brain cells to be active.

When they ran their “hand” over a shape, thousands of neurons were stimulated, using electrical impulses, in the primary tactile cortex. By training themselves over time, concentration in the monkeys increased until they were able to move the hand effectively to be rewarded with juice. Nicholelis’ team from North Carolina published their work in *Nature* and hope that this technology will result in advancements in the treatment of people who have paralysed arms and/or legs. Such people need a lot of physiotherapy in order to learn how to walk again without the sensory information from the feet regarding terrain, resulting in falls; similarly with people with paralysed arms/hands dropping things. They are hopeful that the technology will be ready by the football World Cup in Brazil



in 2014, as they hope to demonstrate it working in two quadriplegic teenagers kicking a football around.



Source: <http://www.guardian.co.uk/science/2011/oct/05/monkeys-mind-control-virtual-arm>

Image: <http://tinyurl.com/62lto5x>

# Stem Cell Therapy Cures Diabetes in Rats – 10/10/11

Stem cell therapy has long been considered to be the greatest hope for curing diabetes, and now a rat-based model has shown how it could be possible.

The team from Japan were able to mount neural stem cells from the olfactory bulb (part of the brain involved in dealing with smells) or hippocampus (involved in memory) a collagen removable scaffold on the pancreas of diabetic rats, to express functioning beta cells. In both type I and II diabetes, beta cells lose their ability to produce insulin, meaning that the patient's blood glucose levels have to be maintained through artificial insulin administered by the patient themselves.

After two weeks of replicating the cells, the team were able to introduce them into the diabetic rats on the artificial collagen scaffold. This was able to work with the rat's own pancreas without damaging it. Within a week the diabetic rat's blood glucose levels were in line with the control groups. After 19 weeks the treatment was halted and the rat's diabetes returned.

This therapy holds real hope for human diabetics as previous theories regarding gene therapy have fallen flat due to the need for the cells to be genetically modified outside the body, whereas this technique avoids this issue. Because the cells came from within the animal they would be used in, there were no issues with tissue-rejection, which can ultimately be more of a burden than the replaced organ in transplant patients.

Source: <http://www.newscientist.com/article/dn21019-diabetic-rats-cured-with-their-own-stem-cells.html>

# Environment

# Nitrogen Pollution Cost – 11/04/2011

Pollution caused by nitrogen from agriculture is costing every European up to £650 a year, due to the damage it causes to the environment, wildlife, water supplies and health, according to a new report out suggests.

Nitrogen-based fertilisers were needed to supply the need to feed a growing world population, however, we are now eating 70% more meat and dairy products than is required for a healthy diet. This excess means that more of the nitrogen-containing fertilisers have to be used to keep up with demand. The cost of damage these fertilisers cause to air, water, soils, wildlife and increased greenhouse gases was estimated to be between £62 billion and £282 billion a year.

Nitrogen air pollution can cause respiratory complaints, cancer and reduces life expectancy across Europe by up to six months. Such fertilisers produce Nitrous Oxides, which are greenhouse gases and nitrates, which damages human health and wildlife.

Despite this, a 60% reduction in 20 years of nitrous oxides and almost a 20% reduction in nitrogen fertiliser usage.

Professor Watson, the chief scientist at DEFRA said: "The challenge is how do we capture the benefits of nitrogen and minimise the impacts." The report, from UK's Centre for Ecology and Hydrology, also suggests more efficient use of fertilisers and people eating less meat would reduce nitrogen pollution across Europe.

# Green Future for the UK – 15/05/2011

The cabinet have reached an agreement on huge cuts in the UK's carbon emissions, with the aim being that 40% of our power is from renewable sources by 2030.

Before last year's election, David Cameron promised that his government would be the "greenest government ever". However, Vince Cable and George Osborne have their doubts whether such revolution is realistically affordable in a post-recession Britain. Despite some opposition, the "green deal" passed and is legally binding until 2027. This makes Britain the only nation to have legally binding commitments to reduce carbon emissions past 2020, making us at the forefront of cutting greenhouse gases. The legislation puts the targets of reduction at 60% by 2030 and 80% by 2050, compared to 1990 figures. The committee's report also predicts that 31% of new cars and 14% of those already on the road will be electric by 2025.

The counter argument to Osborne and Cable's opposition is that because Britain is now committed to a huge expansion in renewable energy, major companies will be looking to invest in Britain. This news comes a week after the heads of 15 environmentalist groups wrote an open letter to the Prime Minister warning he was "in danger of losing his way on environmental policy."

I believe this legislation is brilliant news all round. Obviously, it will be good for the environment if the targets are met. As above, it will also be welcome news for the economy with industry looking to invest in this country and therefore creating thousands of jobs. It also shows that Britain is still innovative in industry and we can compete with the emerging industrial powers such as India and China.

# Platypus Affected Early by Climate Change – 17/06/2011

Researchers in Australia have used data collected over 200 years to reveal the effects of climate change on the platypus.

Platypus numbers dropped in the 200 year period in tandem with decreases in annual rainfall, (i.e. a measure of availability of aquatic habitat) and an increase in annual maximum temperature. Both of these factors powered a shift between cool conditions to warmer conditions in South East Australia. A projection has been made using different modelling scenarios of the climate and the platypus habitat and shows a conservative estimate of more than a 30% reduction of platypus in liveable conditions by the year 2070.

Klamt, Thompson and Davis who authored the paper state an increased demand for water for agriculture and human use, coupled with increased global temperatures as the cause of the platypus' demise. Recent genome sequencing data has shown that the platypus has "a combination of reptilian, mammalian and unique characteristics", making it of great evolutionary importance to amniote vertebrates.

This study reveals the extent to which climate change and human's needs have had an impact on this one species. Huge data sets like the one that formed the backbone of this paper are rare but are also of great importance to understanding long-term damage to species.

Early response of the platypus to climate warming. Klamt M., Thompson R., Davis J. (2011).

# Underground River Found Beneath Amazon – 26/08/2011

Brazil's National Observatory has discovered an underground river beneath and approximately the same length as the Amazon.

Researchers used thermal information from 241 inactive oil wells, which were drilled in the 1970s and 1980s, by Petrobras the Brazilian oil company. The data collected enabled the team to identify water moving 4km below the surface of the Amazon River.

The newly discovered river has been named Hamza after the leader of the research team Valiya Hamza. Like the Amazon, the Hamza flows west to east, meaning that the Amazon rainforest has two drainage systems. Despite only being preliminary data, Hamza expects to confirm the flow of water in the Hamza river by the end of 2014.

Source: <http://www.guardian.co.uk/environment/2011/aug/26/underground-river-amazon>

# Report on Deepwater Horizon Oil Spill – 15/09/2011

April 2010 saw BP's Deepwater Horizon oil well blowout in the Gulf of Mexico, spilling five million of barrels of oil in the 87 days that passed until it was fixed.

A report published yesterday showed that there were shortcuts taken by BP which caused the catastrophe last year. A failure in the cement at the base of the drilling rig was found to be the main cause. This was followed by mechanical and human errors which caused highly pressurised oil to explode killing 11 workers.

The 500 page report put together by the Coast Guard and the Bureau of Ocean Energy Management, Regulation and Enforcement cites "poor risk management last-minute changes to plans, failure to observe and respond to critical indicators, inadequate well control response and insufficient emergency bridge response training by companies and individuals responsible for drilling at the Macondo well and for the operation of the Deepwater Horizon" as the reasons for the loss of life and the following pollution of the Gulf of Mexico.

This report goes further than previous ones, stating that at least seven federal laws were violated, and that BP, Transocean (who own the drilling rig) and Halliburton (responsible for cementing the rig) shared the blame for the disaster. The Justice Department are carrying out criminal investigations which could result in heavy fines for those involved.

The cost for the accident may be split between the companies, who are all trying to shift the blame to one another in a multibillion dollar litigation, in addition to the families of the killed workers who are suing the companies.

Source:

[http://www.nytimes.com/2011/09/15/science/earth/15spill.html?\\_r=1&ref=science](http://www.nytimes.com/2011/09/15/science/earth/15spill.html?_r=1&ref=science)



# Sub-Antarctic Lake Research on Evolution, Climate Change and Extra-Terrestrial Life – 11/10/2011

A British team head to Antarctica at the end of this week to sample the water and floor of Lake Ellsworth, which has been under the Western Antarctic Ice Sheet for between 125,000 and 1 million years. Their hope is that they will gain understanding about evolution on Earth, the impact of climate change and the possibilities for extra terrestrial life.

The lake, which is about as big as Lake Windermere and one of 387 sub-glacial lakes on Antarctica, is kept in a liquid state by the action of geothermal heating from the Earth's interior. The team will bore through 3.2km of ice with hot water, making a hole approximately 36cm wide for a probe to be sent down to collect samples. They will then have a window of about 24 hours before the borehole freezes over again.

Because the lake has been isolated from the rest of Earth for such a long period of time, it is thought that any organisms that are present will give researchers an insight into evolution on Earth and are likely species that have never been collected or witnessed by humans. Even if no organisms are found, it will help to define the limits of life on Earth.

The Western Antarctic Ice Sheet holds enough water to increase the global sea level by 10 – 23ft, meaning that understanding the history and ecology of the Sheet will improve our understanding of the effects of climate change.

The structure of Jupiter's moon Europa is similar to that of the Western Antarctic Ice Sheet, meaning that any organisms found to be viable here could be models for life away from Earth.

The research will start properly next year.

# Health

# Drinking Pledges Criticisms – 14/03/2011

Six of the biggest health groups in Britain, including the British Medical Association and the Royal College of Physicians, have refused to sign up to the government's alcohol "responsibility deal", which is aimed at reducing alcohol abuse in the UK.

The associations call the pledges, which would see tightening up on promotions and advertising of alcohol, were "neither specific nor measurable" and had lost faith in the deal as it is unclear what would happen to the industry if it did not meet the pledges. The shadow health secretary John Healey described the six associations' move as a "damning criticism" of the government's policy.

Andrew Lansley retorted by saying that the measures were just a small part of the government's overall strategy to see alcohol abuse reduce. From the British Medical Association, Professor Nathanson said that the government fell short on taking tough action about this problem.

# 115 year old X-ray machine is compared to its modern counterpart – 16/03/2011

After the discovery of X-rays in 1885 by Wilhelm Rontgen, scientists started researching into what could be done with them.

The original system of X-ray imaging was concocted by Dutchmen H J Hoffmans and Lambertus Theodorus van Kleef, who built the instrument out of spare parts laying around the high school where Hoffmans worked.

After being uncovered in a warehouse in the Netherlands last year on a television programme, scientists recreated the conditions used by Hoffmans and van Kleef to compare the 115 year old machine to a modern counterpart. The older machine used a dose 1500 times stronger than that of its modern day descendent, so Kemerink used a cadaver's hand as the subject.



Photograph comparing 115 year old X-ray machine (left) and a modern one. BBC.

What is clear from these photographs is that the sensitivity and resolution of the modern one is far superior to that of the older one. It shows that modern science has allowed lower X-ray doses not to compromise high quality imaging. So, regardless of the fact we are still using a technology that has been around for more than a century, this comparison shows that it has been refined and improved to make the images as clear as possible and the procedure as safe as possible. None of which would be possible without the research carried out into X-ray's effects on the body and the advancements in technology.

# Cigarette Packaging Legislation is 100 years in the making – 18/03/2011

“Juvenile smoking is spreading like an epidemic. It is impossible to estimate the injury which boys are thus doing themselves.” This quote from R. Martin is the opening lines to a paper first published in 1900 by Juan Breña in which he describes the “vice” of smoking in the youth and suggests means of combating it.

The paper describes how the authors of a different paper used to be shocked seeing 12, 14 and 16 year olds smoking, but are now shocked to see 6 to eight year olds smoking. It also quotes some statistics from the Yale class of 1891, which found that people who were addicted to smoking gained more weight than their non-smoking classmates, who had a larger diameter thorax compared to the smokers.

This paper also brings to light some stats about respiratory problems being experienced more in smokers, as were digestive problems. The males that had began smoking before they were 16 years old made up the majority of smokers in the study.

Breña is convinced that there is an urgent need for the correction of an “evil of such deplorable consequences for the coming generations”. He calls for the banning of tobacco’s use in public places by under 16s, those who supply them to be punished, more education for non-smokers and a programme to point out the “manifold evils” of smoking, especially in the youth.

In 1900, this must have been revolutionary. Unfortunately it has taken the best part of a century for education about the consequences of smoking to be implemented. The banning of tobacco’s use in public places has only just come into some European countries in the 21<sup>st</sup> Century and is still not applied widespread. How anyone can chose to smoke in the 21<sup>st</sup> century, with all the research and knowledge about smoking that is now known, is beyond me.

Cigarette packaging matters and the introduction of plain packaging for cigarettes will stop children wanting to buy them. Smoking is a childhood addiction, not an adult choice.

# Alzheimer's Gene Link Maintains Theme –

## 03/04/2011

The study of the genes from more than 50,000 people has alluded to five new genes that make the onset of Alzheimer's more likely in the elderly. The genes add to an interesting theme that the increased likelihood of Alzheimer's disease is linked to genes involved in inflammation and cholesterol.

Alzheimer's is a disease caused by an accumulation of amyloid-beta in the brain, which in later stages forms plaques and "tangled" proteins called tau are seen in dead/dying nerve cells. It is not known why this accumulation occurs, why the body cannot control the levels of amyloid-beta, or what connects amyloid-beta and tau.

Alzheimer's disease is thought to affect men and women equally and usually starts from the age of forty, with the numbers exponentially increasing in higher age brackets. As many as 18 million people worldwide are thought to be living with diagnosed Alzheimer's disease and this number is projected to nearly double by 2025 to 34 million due to ageing populations around the world.

[http://www.searo.who.int/en/Section1174/Section1199/Section1567/Section1823\\_8066.htm](http://www.searo.who.int/en/Section1174/Section1199/Section1567/Section1823_8066.htm)

The findings of the two studies (one by Tanzi, one by Mayeux et al) will be published in Nature Genetics on 4<sup>th</sup> April 2011, and contain such a large data set (thanks to collaborations from researchers in Britain, USA, France, and other European countries) that researchers are convinced that the link between cholesterol and inflammation genes and Alzheimer's is significant. Even though having one of the genes only increases a person's risk by 10-15%, it is more than sufficient for understanding the disease and the possibility of developing new therapies.

There are now ten genes associated with Alzheimer's in the elderly. The studies to be published tomorrow also confirmed that the previously associated genes were linked to onset of Alzheimer's.

This cooperation between institutes to share data and put aside their individual selfish goals for the greater good of collecting huge data set will allow more concrete conclusions to set and ultimately bring about more successful therapies quicker than would otherwise be possible.

Source:

<http://www.nytimes.com/2011/04/04/health/04alzheim.html?pagewanted=2&r=1&hp>

# How to mend a broken heart – 04/04/2011

American researchers have successfully seeded human stem cells into a dead human heart and started to see the cells grow, marking a milestone in stem cell research. The breakthrough could remove the anxiety for those patients with cardiac problems waiting for a transplant.

Stem cells are undifferentiated cells in every human, meaning they have the potential to become any type of cell, for example a muscle cell, brain cell, stomach cell, given the right conditions. The research has been dogged by controversy and opposition since Ernest McCulloch and James Till demonstrated their existence in the 1960s. Religious groups claim that scientists are playing God by manipulating stem cells into other types of body cells.

In this research, they stripped dead patients' hearts of all their cardiac cells, leaving behind the protein "skeleton" of the heart. A growth factor called NRG1 was then used on human stem cells which were then seeded into eight of these hearts. The stem cells have started growing and, more importantly, have started differentiating into heart cells.

The team, headed by Doris Taylor of the University of Minnesota, have already seeded the stripped hearts of rats and pigs with human stem cells. These grew and started beating independently, only at 25% of normal strength, but beating nonetheless. Researcher's at Australia's O'Brien Institute have already grown human heart cells in culture and seen them start beating. The cells in Taylor's experiments however are the first *in vivo* models and are expected to start beating within weeks. Despite this success, a practical application for such cells is still decades away, however with research like this, it is becoming an ever increasing reality.

Stem cell research has the promise of saving millions and millions of people's lives, going beyond rudimentary transplant surgery in which the patient runs the risk of rejection of the organ/tissue and can be worse off for having the transplant. The manipulation of stem cells is not playing God, it's doing what we do best, learning how the body works and then inventing new ways to keep ourselves alive for as long as possible.

Source: <http://www.theaustralian.com.au/news/health-science/human-hearts-created-in-the-lab-have-scientists-excited/story-e6frg8y6-1226032923689>

# Superbugs Vs. Viruses – 11/04/12

Last year in Europe, more than 25,000 people died from a bacterial infection, which was resistant to antibiotics. Since penicillin's discovery and extraction by Fleming, Florey and Chain, antibiotics have been at the forefront of Western medicine's response to bacterial infections. With the rates of resistant bacteria rising, is it time the West move into a post-antibiotic era?

Bacterial strains become resistant to antibiotics through natural selection, with the antibiotics posing as the selection pressure. When a bacterial infection is bombarded with an antibiotic that it has never come into contact with before, almost all of the cells will be killed. In rare cases, a genetic mutation will cause the cell in which it is to be less susceptible to the antibiotic. As only the single cell with the mutation has survived, the patient is cured after antibiotic treatment, because an individual cell is not sufficient to cause symptoms.

However, this single cell replicates, passing on its genetic material, including its resistance to the antibiotic. Over the course of years and decades, this strain will have been transferred around the world, through the air, person-to-person contact, water supplies etc. Not only that, but it will be the dominant strain found because it is better adapted to surviving antibiotic onslaught.

So then we get to a point where so-called "superbugs", such as MRSA, cause thousands of deaths around the world because we have not designed antibiotics to deal with this strain. So why not design new and better antibiotics?

There are a few main reasons, primarily of which, as always, is money. The estimated cost, from discovery to market, to produce a new drug is £700 million, and nobody has had money to spend in recent years. This, coupled with the fact that drug companies concentrate on products that are going to be used for years by millions of people, such as depression or heart disease medication, make antibiotics - that will only be used for a matter of weeks - an unattractive business opportunity. This £700 million process also takes approximately 15 years, which is a long time when the drug produced is not necessarily going to be effective against the strains that are around when the drug gets to market. On top of all this, without the bacteria already existing, it is difficult to predict how the bacteria will mutate into a resistant strain.



A possible solution to this seemingly never-ending cycle of drug production and bacterial resistance is the use of bacteriophages. Bacteriophages are a group of viruses that specifically infect bacteria. Using a bacteriophage, which specifically attacks *C. diff*, for example, should be effective as a treatment against *C. diff* infections. The evidence is starting to materialise to back up the promise that bacteriophages have. The increase in hand washing practices in UK hospitals by staff and visitors "appears to be responsible for the reduction in MRSA cases.", says Prof. Thomas, a molecular geneticist from University of Birmingham. What is clear, despite the confusing deluge of tabloid scaremongering, is that we in the West need to move beyond the current antibiotic conundrum and exploit new innovations and techniques to wean ourselves from the antibiotic addiction we have, which has got to a point where they are becoming less and less effective with the emergence of more and more unsusceptible bacterium.

# Ovarian Cancer Blood Test – 27/04/2011

Nearly 7000 women a year are diagnosed with ovarian cancer in the UK , with only about 2000 of them still alive five years later. Britain has a woeful record when it comes to ovarian cancer survival rates and early detection (of any cancer) is the best hope for successful treatment.

A £20 diagnostic test, which measures the CA125 protein in the blood, can detect cancer in half of cases. This coupled with ultrasounds of the abdomen would make a measureable difference, believes consultant gynaecological oncologist Mr Charles Redman. CA125 is a tumour marker protein and can be used diagnostically as it is present in higher concentrations in the blood when a tumour is present.

Symptoms for ovarian cancer include increased need to urinate, abdominal pain and feeling full after eating only a small amount, which sound like trivial problems and something that would be easy to ignore or put down to a minor illness like a cold or a stomach bug.

As with any ailment, getting the symptoms checked by a doctor as soon as possible means more effective treatment if there is something wrong, and less anxiety if there is nothing worry about. A lot of people feel embarrassed seeing the doctor or feel that they don't want to bother them with seemingly trivial complaints like the ones for ovarian cancer, but that is what they are there for. As patients, we largely have no idea what symptoms are significant and which are not. That's exactly the reason why we have doctors, to put our minds at ease and to inform us of the best treatment for us as individuals, depending on our individual cases.

# Advertising Spending Freeze Has Cost Lives – 30/05/2011

Andrew Lansley has been forced to back track on his plans for NHS spending freeze after a Department of Health report showed that lives had been lost due to the lack of spending.

After effectively ceasing all publicly-funded advertising last year, the report found that visits to the Government's drug abuse website FRANK were down 22%, the smoke-free website's hits were down 50% and people joining the healthy lifestyle website set up by the government were down two-thirds as well. Most significantly, the Department of Health also found that due to the lack of advertising about help available to stop smoking, the number of people signing up to try and quit was down and this has caused the number of people dying from smoking-related illnesses to increase.

This is in addition to the department's criticisms of the government's decision to cut advertising for flu vaccinations following an increase in deaths from flu this season compared to last. A disproportionate number of deaths from flu this year were amongst young people, which the department is suitably worried about.

In response, the government has put aside an extra £15 million to promote its anti-smoking website and £14 million to promote healthy lifestyles. This amount is still less than the Labour government spending, which was over double at £93 million.

Director of Tobacco studies at Cancer Research UK, Professor Robert West, told the Observer that lack of advertising will cost lives and added that for every year someone over the age of 35 smokes, they lose three months of their life expectancy.

The number of people "not wanting to quit at all" is at its highest since 2007 when data started to be collected, at 30%.

A Department of Health spokesman refuted the claims that the decision to start spending again was a "U-turn" and stated the government were testing the efficacy of previous spending.

The damning verdict comes after a high profile "listening exercise" Andrew Lansley headed where he took questions from, and listened to the concerns of health professionals. Clearly, he hasn't listened to the opposition to his spending freeze on advertising; and has been advertising his "good intentions" more than practical advice and services available to the public to improve their health.

Source: <http://www.guardian.co.uk/politics/2011/may/28/andrew-lansley-u-turn-public-health-cuts>

# Mobile Phones MAY Cause Brain Cancer.

## Evidence Still Inconclusive – 01/06/2012

The World Health Organisation (WHO) published a report stating that mobile phones may cause brain cancer in long time users, terming them “possibly carcinogenic to humans”.

This has caused mass hysteria amongst newspaper writers who have stated that mobile phones do cause cancer in long term users. The fact is though that after studying the data available, the WHO still cannot say for definite if long term use of mobile phones poses a serious health risk to humans.

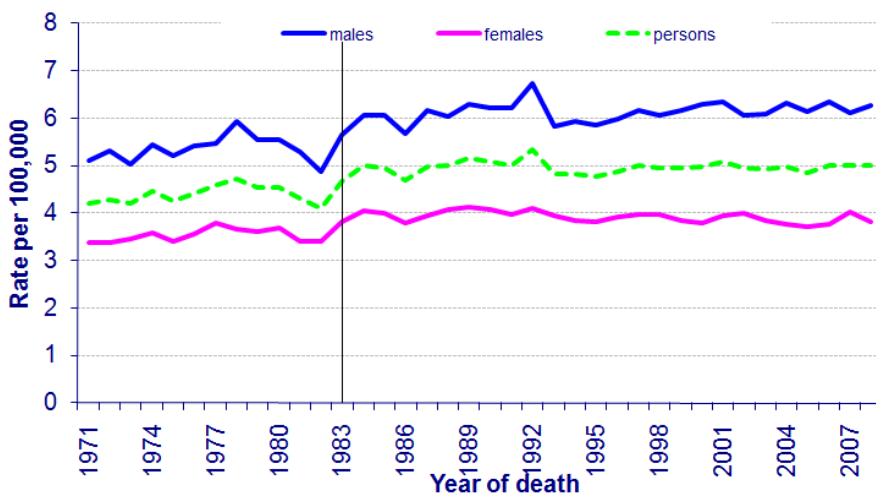
Mobile phones have been put in the same category (“2B – Possibly carcinogenic to humans”) as coffee, pickled vegetables and printer ink.

Below is a graph from Cancer Research UK data showing standardised rates of brain cancer. I have added a line at 1983 to show when the first commercially available mobile phones were produced. Note that in nearly thirty years, the prevalence of brain cancer is not statistically different to the numbers in 1983.

Panic over? Good.

<http://info.cancerresearchuk.org/cancerstats/types/brain/mortality/>

**Figure 2.2: Age-standardised (European) mortality rates, brain and other central nervous system tumours, by sex, UK, 1971-2008**



# Killer Cucumbers Expose Bad Journalism – 05/06/2011

With the “killer cucumbers” and what not in the news this week I thought I should write a blog about *E. coli*.

More accurately, this blog post is about the bad journalism of the *E. coli* outbreak in Europe, which started from German crops.

First things first, *E. coli* is (as even Wikipedia correctly states) a gram-negative rod bacteria. All of the links below are to stories from previously-reputable news agencies which state that *E. coli* (spelt and formatted in a number of scientifically-incorrect ways) is a virus.

This only highlights how little research is done by scientific/health journalist who are more journalists than scientists. A global version of Chinese whispers and not double checking facts leads to poor science communication and ill-informed readers. It's unbelievable that such reporting can go unreviewed before publication to millions of people.

[http://www.yorkpress.co.uk/news/9064340.Father\\_tells\\_of\\_fear\\_as\\_children\\_struck\\_down\\_by\\_E\\_coli/](http://www.yorkpress.co.uk/news/9064340.Father_tells_of_fear_as_children_struck_down_by_E_coli/)

<http://www.thelondondailynews.com/ecoli-virus-spreads-p-5299.html>

<http://www.bbc.co.uk/news/uk-13637073>

...

<http://travel.usatoday.com/flights/post/2011/06/aa-salad-menu-europe/172974/1>

<http://www.foxnews.com/health/2011/06/03/2-us-military-members-sickened-as-e-coli-outbreak-stabilizes-in-europe/?test=latestnews>

<http://www.channel4.com/news/e-coli-outbreak-is-new-strain-as-three-more-fall-sick-in-uk>

# Eating Dirt Saves From Pathogens –

## 08/06/2011

Despite all the animals and plants that can be eaten, researchers have found that some people are eating dirt, which they now say can be beneficial.

Meta-analytical research on 330 cases in animals and 482 cases in humans has led researcher to believe that eating dirt may protect against pathogens in the gut.

The work, led by Sera Young of Cornell University, showed that geophagy (the technical term for eating dirt) is not associated with hunger, or an instinctive response to a lack of nutrients.

After analysis of the types of clay in question, they were shown to have little nutritional value. Older animals and humans with calcium deficiencies generally do not eat dirt; further disputing the theory that animals turn to soil as their bodies require nutrients.

It was found that geophagy can be beneficial to pregnant women and pre-teen children as eating dirt prevents pathogens and parasites from causing infections. Previous research by Young also dismissed other research, which claimed that geophagy increases the risk of illness in some school children.

If this sounds appetising, there is a way to eat dirt. People who practice geophagy get the dirt from deep in the ground and often boil it before eating.

Please note, Mississippi Mud Pie doesn't count.

Source:

<http://news.discovery.com/human/eating-dirt-more-adaptive-than-thought-110607.html>

# Strict Diet Cures Type II Diabetes – 24/06/2011

Research at the University of Newcastle has found that people with Type 2 diabetes could be cured of the condition by sticking to a 600 calorie a day diet. Previously thought to be a “life sentence” as Professor Taylor of Newcastle University put it, it has now shown that it can be reversible.

After only one week of eating non-starchy vegetables and zero-calorie drinks, the body was able to produce its own insulin, in line with the normal group, which then regulated the person’s blood sugar level. The drop in calories is likely to reduce fat on the pancreas and allow it to function effectively after a few weeks of the diet.

The link between overeating/obesity and the condition has the adding backing of the findings. The research suggests that higher levels of fat, especially on the liver and pancreas, are the main cause of Type II diabetes.

Almost 3 million people in the UK live with Type II diabetes knowingly or unknowingly. The findings could not only save lives but also save the NHS a fortune. Treating Type II diabetes costs the NHS £9 billion a year.

Research like this provides hope for the millions of Type II diabetics, and millions of others currently suffering with chronic conditions. If Type II diabetes can be cured with a simple change of diet, what other diseases can be cured with simple changes?

# Genome Editing Can Repair Defects –

## 29/06/2011

Researchers have been able to reverse the effects of a genetic defect in a living animal for the first time with no apparent side effects.

Haemophilia B is a genetic condition that results in the body being unable to produce blood clots, which can prove fatal even if the person has not been injured. Mice had been made to develop the condition by genetic manipulation, resulting in them not being able to produce clotting factor.

Katherine High and her team at Children's Hospital of Philadelphia were able to produce "clinically meaningful results" by using a complex series of methods. Firstly, an enzyme is incorporated into a harmless virus and injected into the mouse. The virus then travels to the liver, where clotting proteins are made. It enters and releases the enzyme into the liver cells (hepatocytes) and the enzyme binds to the DNA where the fault is.

The enzyme then cuts the DNA. Injected along with the virus-containing enzyme is the correct DNA template for the haemophilia gene. These strands of DNA are used by the repair machinery of the cell and added where the enzyme has cut out the faulty copy.

Despite the sound theory, the efficiency of this method is very low (approximately 5%). However, High describes the difference in Factor 9 (the clotting protein) with and without Genome Editing as drastic as 5% of Factor 9 is the difference between severe and mild haemophilia, which massively reduces the daily danger to the animal.

Gene therapy has been hugely promising for about 25 years, but has failed to deliver until now. High and her group have been able to insert copies of genes into the genome instead of just adding copies to the body as a whole. Previous gene therapy attempts were untargeted and caused leukaemia and other cancers. Genome Editing promises to avoid these issues as the approach is targeted,

A similar method has been proposed, and is being worked on in the US, to change the immune cells of people suffering with HIV that could make them resistant to the virus.

Source: <http://www.guardian.co.uk/science/2011/jun/26/doctors-breakthrough-repairing-genetic-defects>



# First Fully Artificial Organ Transplanted – 10/07/2011

A cancer patient has become the first person to receive a transplant of an artificial organ.

The technique, co-designed by British scientists, used the patient's own stem cells as a "scaffold" to create a new windpipe. The unnamed 36 year old student had life-threatening tracheal cancer.

Tracheas have been produced before but using donated collagen, this is the first time the patient has provided their own stem cells, which means the chances of a successful transplant are greatly increased. Two days after applying the stem cells to the Y-shaped scaffold made of a plastic-like polymer, they had differentiated into tracheal cells required for the transplant.

Professor Seifalain, of University College London, who designed the scaffold, described it as "a milestone in regenerative medicine". The new nanocomposite polymer offers new developments in transplant medicine and will reduce the associated risks of tissue rejection and should increase the number of organs available.

# RNA-Based Regenerative Medicine Hope – 14/07/2011

A new technique in regenerative medicine appears to be able to bypass the stem-cell stage of development and create brain cells from skin cells, spelling a huge stride forward towards the treatment of neurological diseases such as Alzheimer's and Parkinson's disease.

The mature nerve cells were created by the relatively easy step of adding two short strands of RNA to the skin tissue of a 30-year old woman. The RNA triggers the start of the development of nerve cells, using the genetic machinery already in place in the skin cells. The cells produced were characteristic of neurons of the frontal cortex, where the higher-order aspects of cognitive and emotional functions occur.

Published in Nature, the findings are described “very weird” by Crabtree, a professor in pathology at Stanford Medical Centre, California. He added that this technique bypasses the “problem in neurobiology”, which is the “lack of a good human model” as people are not willing to donate nerves.

Until now, to produce a cell type from another one required stem cell work, which, despite its recent advances, is still fraught with difficulties and overshadowed by noisy religious protestors. Recently, skin cells have been genetically modified into embryonic-like stem cells, which were then converted to nerve cells. This new RNA-based method avoids these relatively complicated stem cell based middle steps, and could be invaluable to providing cures for neurological diseases. With refinements and different RNA strands, this technique could also treat other diseases where a specific cell type is lost.

Source: <http://www.independent.co.uk/news/science/hope-for-millions-of-alzheimers-sufferers-as-scientists-make-brain-cells-from-human-skin-2313307.html>

# Gene Therapy for Possible TB Vaccine –

## 05/09/2011

A modified version of *Mycobacterium tuberculosis*, the bacteria causing TB, could be used to prevent the disease according to research in the US.

Currently, the BCG jab is the only TB vaccine and is woefully ineffective; however experiments in mice have shown that the modified bacterium can rid all tuberculosis bacteria in some cases. The potential to turn these findings into a practical application for human vaccine is unknown. The WHO says that the disease is one of the top ten causes of death, causing about 1.7 million people a year, so a more effective vaccine is highly desirable.

The gene cluster known as *esx-3* helps *Mycobacterium tuberculosis* evade the immune system, and cannot survive without it. Its relative *Mycobacterium smegmatis* can survive without it though, and when the *esx-3* cluster was deleted, then the modified bacteria were inserted into mice with TB, they were disease-free within three days. The team then cut the *esx-3* gene from *M. tuberculosis* and inserted it in place of the *M. smegmatis* *esx-3* cluster, this was called Ikeplus. When injected into mice, they cleared up a Ikeplus infection which resulted in lasting immunity to TB.

Despite the promise, only 20% of mice were described as “long term survivors” by Prof. William Jacobs who led the team, meaning the vaccine would need further development before a human version can be a realistic project.

# European's Poor Mental Illness Treatment – 07/09/2011

Approximately 40% of Europeans, 165 million people, experience a psychiatric illness such as depression and anxiety. Anxiety was the most commonly experienced of these illnesses, followed by insomnia and depression which had half the frequency of anxiety.

Since the mental health survey in 2005 of patients in 30 EU countries, improvements have been “patchy and isolated” according to Hans-Ulrich Wittchen, leader of the study, published in the journal *European Neuropsychopharmacology*.

The cost to governments of mental illness is often indirect because such illnesses result in unemployment, and absenteeism. The key is early diagnosis to preventing a lot of these costs.

Vikram Patel of the London School of Tropical Medicine's facility in India said there was still a large treatment gaps. And, with only one third of those suffering psychiatric illnesses, he suggests that Europe could learn lessons from the developing world about how to use non-specialist techniques to deliver mental health interventions.

Source: <http://www.newscientist.com/article/dn20868-psychiatric-illness-is-biggest-source-of-europes-ill-health.html>

# New Doping Test to Make 2012 games “Toughest on Cheats” – 14/09/2011

With less than a year to go to the London Olympics, the people in charge of anti-doping have promised that 2012 will be the toughest year ever for cheats.

Professor David Cowan was speaking at the British Science Festival in Bradford when he described how the practice of autologous may be able to be effectively tested for, for the first time. Autologous is when an athlete dopes their own blood to self transfuse later, which increases the athlete's red blood cell count and allow them to carry more oxygen.

In some of the 6000 blood tests that are expected to be carried out during the games, Prof Cowan said that the age of the blood samples would be compared by using the genetics of the red blood cells. Analysing the change in RNA in the cell could provide markers which will allow scientists to distinguish between natural blood and stored blood.

After homologous blood doping (using family member's blood of the same type) was rife in winter and cycling events in the last 20 years, and after a Madrid-based “doping ring” was busted in 2006, athletes have been ever-more reliant on their own supplies. Effective tests were produced to detect that kind of doping, and Prof Cowan gave his strongest hint yet that an effective test for autologous doping would be ready by next summer's games.

# Hope for HIV Vaccine – 18/09/2012

A team at Imperial College London has described their “most successful experiment” so far in the long search for an AIDS vaccine, at a conference in Bangkok, Thailand.

The study analysed samples from a previous study in which they found that after three years, over a third of the 16,000 people vaccinated were less likely to contract HIV, compared to those given a placebo. The vaccine regimen was in two parts, firstly a primer vaccine followed by a booster. Interestingly, both parts had failed when used individually, but when used together, they had a “greater than the sum of its parts” effect resulting in modest but promising results.

The researchers believe the immunity is associated with the antibody IgG, which recognises the V2 loop portion of the HIV molecule’s outer envelope. It is thought those who were not helped by the vaccine have a problem making the IgG antibody, and thus the vaccine didn’t prevent HIV infection in them.

Quietly confident about their findings, the team are planning follow-up experiments using primates infected with a related virus to that of HIV to test more theories about the role antibodies can play. The findings will focus people’s attention on the role of IgG antibody – V2 loop interaction, which could be the start of a more focussed development into an effective vaccine.

# Dementia-Free 115 Year Old's Genome Sequencing Clues – 17/10/2011

The entire genome of a 115 year old woman is being mapped in an attempt to gain insights into the role genetics play in ageing and dementia.

The woman, who is only known as W115, has become the oldest person to have her entire genome sequenced. Dr Holstege of the VU University Medical Center, Amsterdam, stated that the woman had some “unusual genetic changes”, which could protect her from dementia and other degenerative diseases associated with old age.

She was born prematurely, and lived a healthy life until she was treated for breast cancer when she was 100. She entered a nursing home when she was 105 and performed as well as a 60-75 year old in a mental test, performed when she was 113. She died at the age of 115 of stomach cancer.

On post-mortem, the doctors could not find any evidence of furring arteries (associated with heart disease) or dementia.

The researchers are making her genome data available to other research groups in the hope that some lessons can be learned about how she was able to live so long, so healthily and without any signs of dementia.

# Lung Cancer Vaccine Shows Promise –

## 24/10/2011

A vaccine has been showed to slow the progression of lung cancer in 148 lung cancer patients.

The vaccine, called TG4010, induces an immune response against the most common type of lung cancer. The immune system is able to identify changes in the cell-surface proteins of cancerous cells and attack them specifically.

TG4010 is a modified pox virus and was administered in combination with chemotherapy to half of the patients in the trail, all of which had non-small cell lung cancer. Six months later, the stability of the disease was analysed and the progression free survival rate was 43% in the vaccinated patients compared to 35% in those who did not have the vaccine. However, average survival rate was only increased by 0.4 months in the vaccinated patients.

Improving survival rates would be more beneficial than slowing progression, however further research will answer questions regarding harnessing the power of the immune system to kill cancer cells and ultimately improve the overall survival rates for patients.



# Improved Antibody Therapy for Multiple Sclerosis – 25/10/2011

A monoclonal antibody called alemtuzumab has shown the ability to not only halt Multiple Sclerosis (MS), but also reverse the nerve damage associated with MS.

MS is an autoimmune disease in which the myelin sheath around the nerves degenerates leading to gradually increasing disability in the affected nerves. Alemtuzumab effectively “resets” the immune system by targeting the mechanisms that cause cellular damage.

Despite the antibody not performing as well as it had done in phase I clinical trials, 78% of patients in the phase III clinical trials showed no signs of relapse after two years, and had half the relapse rate of interferon  $\beta$ -1a (a standard therapy).

Evidence supporting the reversal of nerve damage was present but not statistically significant. Only 8% of patients on alemtuzumab experienced a worsening of symptoms, compared to 11% on interferon  $\beta$ -1a.

Despite the promise, the drug does increase a patient’s risk of other autoimmune diseases, including thyroid-related autoimmune responses. However, clinicians are eager to use it based on its improved activity compared to currently available alternatives, and is already being used to treat some forms of leukaemia and lymphoma.

Source:

[http://www.nature.com/news/2011/111024/full/news.2011.609.html?utm\\_source=twitterfeed&utm\\_medium=twitter&utm\\_campaign=Feed%3A+news%2Frss%2Fmost\\_recent+%28NatureNews+-+Most+recent+articles%29](http://www.nature.com/news/2011/111024/full/news.2011.609.html?utm_source=twitterfeed&utm_medium=twitter&utm_campaign=Feed%3A+news%2Frss%2Fmost_recent+%28NatureNews+-+Most+recent+articles%29)

# Movember 2011 – 01/11/2011

Every November for the past few years, men across Britain and around the world have adorned hair on their upper lip in an attempt to raise funds for prostate cancer and other men health issues.

Prostate cancer was diagnosed in 37,051 men in the UK in 2008 and was the cause of death in 10,168 men in the same year. This accounted for a quarter of all cancers diagnosed in men.

899,000 cases were diagnosed worldwide in 2008, over two thirds of which were in developed nations.

More than 80% of deaths from prostate cancer occurred in the over 70s, and is a disease that most men diagnosed *die* with rather than *from*. Funds are still needed to support the work done by researchers in this area and prevent tens of thousands of deaths every year.

Donate and get involved at: <http://uk.movember.com/>

<http://info.cancerresearchuk.org/cancerstats/keyfacts/prostate-cancer/>



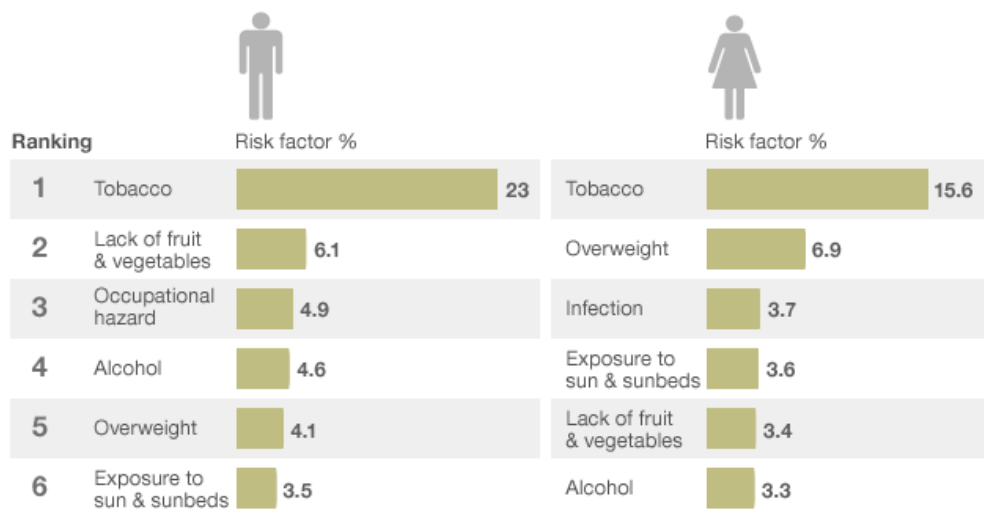
Image: Thomas Dickinson

# Preventable Cancer Report – 13/12/2011

Approximately half of cancers in men and 40% in women are preventable through lifestyle changes, the biggest survey of its kind in Britain found out last week.

Tobacco smoking, obesity, occupation and other avoidable risk factors were all identified in contributing to cancer cases.

In total, over 100,000 cases in the UK every year are thought to fall into the “avoidable” category. For men eating more fresh fruit and vegetables and reducing alcohol intake appears to be important in preventing cancer, and for women the advice was to stop smoking and avoid being overweight. Sir Richard Thompson, President of the Royal College of Physicians, called the report a “wake up call” to government to act on its “failure in the main public health issues.” The coalition has said they will have discussions on plain cigarette packaging by the end of the year.



Source: Cancer Research UK

# Ten Strangest Deep Sea Creatures

# Ten Strangest Deep Sea Creatures; Number Ten; The Dumbo Octopus

The Dumbo Octopus is aptly named after the famous Disney Elephant.

Those are fins on the side of its head though, not ears. It propels itself using them at its habitual depth of 300 to 400 metres below sea level. However, it has been found up to 7000 metres below sea level.

It is a Benthic deep sea creature, which means it lives below approximately 150 metres, where sunlight cannot penetrate, and is a member of the genus *Grimpoteuthis*, which includes fourteen other similar species.

Not much is known about Dumbo as it has rarely been seen and little research into its behaviour has been done. What is known is that it doesn't seem to have a mating season like other deep sea creatures and that it feeds on shrimps and worms.



Image: <http://tinyurl.com/3wsltyp>

Source: <http://www.deepseamonsters.com/component/content/article/63-dumbo-octopus.html>

# Ten Strangest Deep Sea Creatures;

## Number Nine: Salps

The first of many transparent creatures in this countdown are Salps. Transparency is an important feature in deep sea creatures as any reflection of light from a prey's skin can be detected by the highly-sensitive eyes of predators that still have eyes. Evolution has dictated that because of the lack of sunlight, having eyes is not energetically useful and so, many creatures have lost their sight and rely on other methods of detection of prey, as we will see.

The tube-shaped creature feeds on microscopic plants, liberating the carbon dioxide locked up in them, at one end, and excretes solid carbon pellets at the other, which quickly sink to the sea floor. This removes the carbon from the carbon cycle and is seen by biologists as an important step in reducing the effects of global warming.

The invertebrates are one of two non-colonial families in the class of Thaliacea, which are between a few millimetres and a couple of centimetres long.

In the sexual phase of their life cycle, the transparent, hollow bodied, luminescent salps form long chains of individuals. The fertilisation is then internal and the solitary offspring is then expelled from cavity wall of the parent. Then it is free to reproduce asexually by budding.

# Ten Strangest Deep Sea Creatures;

## Number Eight: Hagfish

First described in 1753 by Per Kalm it was mistaken for a blind lamprey, but then later successfully described as a worm.

In the 1790s it was given its scientific name *Myxine glutinosa* (“myxo” meaning “slime” in Greek) and was designated into the “roundmouth” family. This was the first of the 67 species of hagfish now recognised, which reside in both hemispheres and can be anywhere between 183mm (*Myxine pequenoi*) and 1275mm (*Eptatretus goliath*), depending on species.

Hagfish have been found as deep as 1700 metres and do not usually migrate more than 60 miles in their lifetime, spending most of their time on or near the sea floor. Because it lives at such depths, the Hagfish is an invertebrate, meaning it has no skeleton, but instead has cartilage to support its body shape. The Hagfish also lacks a cranium and useful eyes, as the eyes are poorly developed and located under the skin. Young Hagfish have both male and female reproductive organs, but as they grow, some will become male and some will become female. However, they can change sex from season to season.

Its defence mechanism includes producing slime, which can clog the gills of predator fish, causing them to suffocate. When the predator has been successfully deterred, the Hagfish ties itself in a knot to wipe itself clean. This ability to knot is also useful when eating parts of a fallen dead animal from higher up in the ocean, one of its main food sources. It ties itself in a knot to get a better grip on the flesh, so it can bite off bigger chunks. Despite being around for nearly 500 million years, little is known about the Hagfish (much like most deep sea creatures) as conducting studies and monitoring behaviour is difficult at more than a mile below sea level.

# Ten Strangest Deep Sea Creatures;

## Number Seven; Brittle Stars

Basket stars are a specialised type of Brittle stars that have a complex network of branched arms in order to catch plankton. Captured food is then ingested through these highly branched arms and digested in a simple gut, which is completely contained within the small central disc.

Compared to other starfish species, Basket Stars, which are members of the Euryalida family, have a small central disc, and completely lack an anus. Instead their waste leaves via their mouth, which is located on the underside of the central disc.

There are around 100 species of Basket Stars, which live all around the world. Most species are nocturnal and tend to spend their days in hiding, coming out at night to filter-feed on microscopic plants.



# Ten Strangest Deep Sea Creatures;

## Number Six; Cranchiids

Cranchiids are deep-sea transparent squids that can measure anywhere between a few centimetres up to 2 metres.

There are around 60 species of these squids and are found all around the world, between depths of 200-1000 metres. The larvae however are found at shallower waters, they then move to deeper waters as they grow.

Once Cranchiids have fully developed, they are nocturnal animals that rise from the sea bed to feed in shallower waters. They move by utilising an internal flotation device, which is filled with Aluminium Chloride. This allows them to float passively through the water. However, this adaptation reduces the squid's ability to propel itself away from predators like other squid and octopuses, but it is not completely defenceless.

Cranchiids exhibit "balling" behaviour whereby they bring their head and tentacles into the mantle. This forms a tough sphere, which is too large for many predators to eat. In addition, some species produce ink and fill the sphere to provide extra camouflage.

Source:

[http://www.bbc.co.uk/nature/blueplanet/factfiles/molluscs/cranchiid\\_squid\\_bg.shtml](http://www.bbc.co.uk/nature/blueplanet/factfiles/molluscs/cranchiid_squid_bg.shtml)

# Ten Strangest Deep Sea Creatures;

## Number Five; Blobfish

Blobfish were named as one of the ugliest animals in the world, and it's easy to see why.

They live at depths of up to 800 metres below sea level, meaning that they completely lack bones, which could not survive the pressure at such depth.

They consist of a low density gelatinous mass and have low muscle power as a result. In order to feed, they wait for prey to come close enough to them waiting on the sea floor, rather than moving themselves.

Their scientific name is *Psychrolutes microporos* and they are found off the coast of Australia and Tasmania. They are inedible, but are often caught in deep sea nets trawling for crabs and lobsters.

Because they live at such depths, they are rarely seen by humans, but are in danger of extinction due to deep sea fishing off the coast of Australia and Tasmania, which may be their only habitat.



Image: <http://tinyurl.com/yju7o5b>

Source: <http://ihatetheocean.blogspot.com/search?q=blobfish>

# Ten Strangest Deep Sea Creatures;

## Number Four; The Transparent Sea Cucumber

The Transparent Sea Cucumber (*Enypniastes* species) is one of around 1150 species of sea cucumber defined.

They are found all over the world, however, the Transparent Sea Cucumber is macro-benthos, like all the animals found on this list. This means they live on or near the sea floor and are larger than 1mm in size. They are found at around 8000 feet below sea level and because of this are gelatinous (because muscle mass cannot be supported at such pressure) and transparent (for camouflage). Because of this, they do not have lungs, but extract oxygen from the water by drawing in and expelling sea water through their anus. The absorption of oxygen happens locally around the anus.

Also located here is a symbiotic partner of the sea cucumber called *Gastrolepidia clavigera*, which is a worm. In return for somewhere to live and a supply of food from the Sea Cucumber host, the worm keeps the Sea Cucumber clean. Symbiosis is a ubiquitous part of nature, and the deep sea is no difference. This example is very similar to the birds that use the Rhinoceros as a host.

Sea Cucumbers can feed themselves, and their worm, on tiny particles in one of two ways. The “direct deposit” method is where they wipe their tentacles over the sediment to collect any particles present. The “suspension” method of feeding involves the use of buccal tentacles to pick out particles from a water column.

Adult Sea Cucumbers deposit their gametes in the currents at the top of reefs. This develops into feeding or non-feeding larvae, depending on the species. Between 10 and 40 days later, the larvae settle on the sea floor where they develop into Sea Cucumbers.



The Transparent Sea Cucumber:

<http://ihatetheocean.blogspot.com/2011/01/january-14-2011-swimming-sea-cucumber.html>

# Ten Strangest Deep Sea Creatures;

## Number Three; The Deep Sea Anglerfish

The Deep Sea Anglerfish, also known as the common black devil, lives at depths of up to 3000 metres, but unlike other creatures found at this depth, they have powerful muscles.

*Melanocetus johnsoni* is the scientific name for the Deep Sea Anglerfish, which is just one of 200 species of Anglerfish found around the world's oceans.

The most easily recognisable of its features is the moveable elongated dorsal fin that houses a photophore. A photophore is a light-producing organ, for example, like that found on a firefly. The process by which this organ is able to produce light is called bioluminescence and utilises an enzyme called luciferase. As its name suggests, the Anglerfish uses this photophore much like an angler uses a lure to catch fish. It periodically produces light, which attracts smaller fish towards it. This brings the prey closer to the predator and makes hunting and catching food easier. Despite its menacing teeth, the Deep Sea Anglerfish is a small fish that reaches a maximum size of 12cm and is a wide fish for its length. This makes it a slow swimmer and causes it to "wobble" through the water. This makes its lure ideal to make up for its lack of speed and agility in catching its prey.

The photophore produces blue light, and the Deep Sea Anglerfish skin reflects blue light, making it almost invisible to other sea creatures. Its jaw and stomach can enlarge to allow it to swallow prey twice its size, which is useful in the deep sea where food supply is scarce and meals can be few a far between.

Life doesn't get any less complicated for the Deep Sea Anglerfish when it comes to reproduction either. The male is less than half the length of the adult female and when it wants to mate, its digestive system starts to breakdown meaning it needs to find a female. Once it has found a female, it uses small teeth to hook onto the female. He then releases an enzyme which breaks down his mouth cells and her skin cells where he has attached. They eventually become fused together and share the female's circulatory system. A female can carry up to six males at one time.

The reason for this unusual method of reproduction is that when the female is ready, a male is instantly available to her. She then lays eggs in

shallower water, which then develop into larvae that then return to deeper water as they grow.



Image: <http://tinyurl.com/3n2bg3l>

Source: <http://www.seasky.org/deep-sea/anglerfish.html>

# Ten Strangest Deep Sea Creatures;

## Number Three; The Gulper Eel

The Gulper Eel is another example of the lack of imagination scientists have when they name new discoveries or technologies. Its most prominent feature, its huge loosely hinged jaw, allows *Eurypharynx pelecanoides* to swallow meals much bigger than itself. As we saw with the Deep Sea Anglerfish, this can be useful when food supply is not abundant. Its stomach can also stretch to accommodate large meals as well.

In fact, its scientific name reflects this ability: *Eury* (wide), *pharynx* (windpipe/throat area) and *pelecanoides* (a nod towards its resemblance to a pelican beak).

Gulper Eels live in a range of areas around the world and inhabit depths anywhere between 500 and 6000 feet. Despite living at these depths, the Gulper Eel has eyes, albeit very small ones. It is thought that due to the lack of light that can penetrate to the depths they live, the eyes are to detect any glimpse of light rather than for forming images.

Unlike other eel species, its pectoral fins are tiny and it has a thin whip-like tail with a photophoric organ on the end. They use their tale for movement and attracting prey with the bioluminescence given off by the photophore. Adults can grow to between 3 and 6 feet in length and are usually dark green or black in colour.

Despite its large mouth, the Gulper Eel has small teeth so it is thought they do not feed on large fish very often. They are more likely to feed on small crustaceans and cephalopods such as squid and other small invertebrates. Lancet fish and other big deep-water predators feed on Gulper Eels.



Image: <http://tinyurl.com/44shr8d>

Source: <http://www.seasky.org/deep-sea/gulper-eel.html>



# Ten Strangest Deep Sea Creatures;

## Number One; Pacific Barreleye

So, here we are. We've reached number one in the countdown. Now, if you've seen the picture of this creature, it may look like a normal fish, albeit with a transparent head. However, all is not what it seems with the Pacific Barreleye.

First of all, because humans have a strange psychology, in our mind, we assign human emotions and characteristics to animals. We think of sloths as lazy because it sleeps the majority of the day and moves slowly, much in the same way we might say the Blobfish is miserable because of its expression. As you look at the picture below, our minds see a face with two eyes and a mouth on the front, like a normal fish, because it looks quite familiar, which is misleading.

The Pacific Barreleye has its huge olfactory organs on the front of its body. These are the equivalent to our nostrils, and the Pacific Barreleye uses them to detect the scent of small fish that it preys on.

Its eyes are the green organs in the middle of its head, below the outer surface. The enormous lenses search above the mostly stationary creature to spot any fish that may pass by. When food comes close enough to them, their body rotates so that it is facing the same way as the eyes, so the mouth is in its field of view. Unlike other fish, with eyes pointing in different directions, the Pacific Barreleye's eyes point in the same direction, like mammalian hunters.

This gives them greater binocular vision, and therefore allows for better depth perception and making out faint or distant objects. This is useful in the 600 to 800 metre depth in which they live, which is known as the twilight zone. At this depth, daylight is present, but sparse.

Its scientific name is *Macropinna microstoma* and has been known about since 1939, but had only been seen as the mangled remains as a result of deep sea fishing until the footage in the link below was shot. 2004 was the first time it had been seen alive and its transparent head had been seen intact.

Researchers speculate that the Barreleye also feeds by stealing food from siphonophores. These are jellyfish with elongated tentacles they use to catch food. It is thought that the Barreleye is unaffected by the sting due the

structure of its head. Its eyes are also protected because they are below the surface, meaning that the head has to be transparent for them to work at all. Despite looking quite like a normal fish, compared to some other creatures which appear completely alien, the Pacific Barrelfish may be a surprise choice for the top spot in this countdown. Because it is so different to how our minds say it should work, it is the strangest deep-sea creature.



Image: <http://tinyurl.com/3lrq3lw>

Source: <http://www.realmonstrosities.com/2010/12/pacific-barreleye-fish.html>

Space

# Lord of the Rings Meets Star Wars –

## 31/03/2011

The core of the gas giants Jupiter and Saturn could be mapped by scientists who are measuring the wobble of the planet's rings.

When comets hit the rings of these planets they create ripples as the particles making up the rings are displaced. Researchers at New York's Cornell University, headed by Matthew Hedman, are able to measure the wobble by the change in light seen from the rings. The team are able to determine how long ago such a collision happened because the shorter the wavelength of the ripple, the longer ago in time it happened. Much like throwing a rock into water, immediately after the event the waves are going to be at their biggest, and as time progresses, the waves become smaller. A large, and unseen, comet impact happened in 1983 and as it broke up in the atmosphere, the resulting debris caused the whole of Saturn's C ring, which includes the moon Titan, to tilt.

Evidence for ring ripple is also available from Jupiter after Mark Showalter and his team from the SETI Institute in California, sourced two images from the Galileo spacecraft (1996 and 2000) and New Horizons in 2007. Again, they were able to calculate when the two comets hit, one of which matched the prediction by Hedman about the same comet impact they had been studying.

It is thought that the gas giants protect the early Earth from a lot of comet collisions, preventing all but five mass extinctions in this planet's history, because their size resulted in enough gravity to attract comets to them and away from Earth.

Being able to successfully measure the wobble of the rings not only allows us to determine when the rings were hit by a comet, but it will also be able to give us insight into the cores of these planets. The ripples are spiraling towards the core of the planet on which they find themselves. The rate at which they do this is controlled by gravity, which is dependent on the organisation, structure and shape of the cores, all properties of which we have limited ideas.

Source:

[http://www.nature.com/news/2011/110331/full/news.2011.198.html?s=news\\_rss&utm\\_source=feedburner&utm\\_medium=feed&utm\\_campaign=Feed%3A+news%2Frss%2Fmost\\_recent+%28NatureNews+-+Most+recent+articles%29&utm\\_content=Twitter](http://www.nature.com/news/2011/110331/full/news.2011.198.html?s=news_rss&utm_source=feedburner&utm_medium=feed&utm_campaign=Feed%3A+news%2Frss%2Fmost_recent+%28NatureNews+-+Most+recent+articles%29&utm_content=Twitter)

# Titan's Subsurface Ocean – 20/04/2011

Images of Saturn's moon Titan, has revealed that it could have a subsurface ocean, opening up the possibility of finding life beneath its surface. The gravity and radar images, documented by Rose-Marie Baland *et al* at the Royal Observatory of Belgium, seem to suggest that Titan is not a solid satellite but has an ocean below the ice surface.

Titan is the second largest moon in the solar system and is bigger than Mercury. It has a nitrogen-rich atmosphere, containing a little methane (much like early Earth). This atmosphere is five times thicker than the atmosphere on Earth.

Titan is one of only a few places in our solar system thought to be inhabitable, along with Mars, Venus and Europa (one of the moons of Jupiter). This is due to many factors including atmosphere composition and mechanics (such as glaciation and runaway greenhouse gases), temperature, and the presence of liquid water.

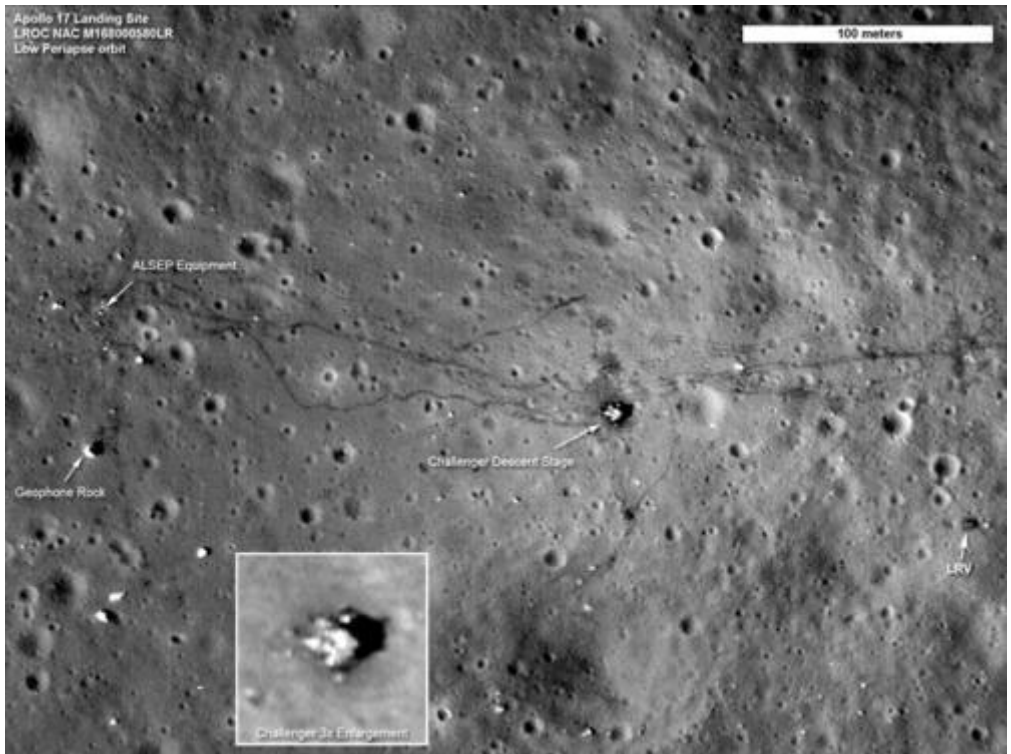
Liquid water is widely believed to be one of the essential components needed to start life. In the past, astrobiologists have looked for water in the universe in order to narrow their search for life. Water allows reduction/oxidation reactions to take place. These allow electron transport, which powers the most fundamental processes of life, photosynthesis and respiration.

Baland's findings could result in the classical Cassini State (whereby Titan is solid) to be overhauled. This would naturally result in previously defined solid satellites to be reanalysed and may even result in other habitable corners of our solar system being uncovered.

# Photographs of Human Activity on Moon – 07/09/2011

Pictures captured by NASA show tracks and debris left by the Apollo 12, 14 and 17 missions' moon landing site between 1969 and 1972.

The Lunar Reconnaissance Orbiter took the photographs from 13 to 15 miles above the moon's surface. It was able to clearly pick out paths taken by the spacemen, tracks left by vehicles and backpacks left behind when the astronauts returned.



Source: <http://www.guardian.co.uk/science/2011/sep/06/moon-photographs-apollo-astronauts>

# Mercury Mystery – 03/10/2011

After spending more than a Mercury year in orbit of the nearest planet to our sun, Messenger landed on the surface on March 18<sup>th</sup>. The flybys that preceded the landing showed craters on the surface of the planet filled with an unidentified bright material.

The craters are between 10 metres and several kilometres across and are thought to be (relatively) young. These were possibly formed by the leftovers of elements leaving the surface that were vaporised easily by the immense heat and escaping into space. Another possibility is that micrometeoroids and protoplanets could have impacted into the early Mercury surface, vaporising volatile elements in the rocks. Instruments on board Messenger revealed that there were a lot more volatile substances than previously estimated. This is not in keeping with the theory of the planet's high density with two thirds of its mass being made up by its metal core.

Whatever the reason for the masses of volatile elements, researchers into planetary formation are going back to their drawing boards.

# X-rays Used to Recreate the Conditions at the Centre of the Earth – 14/11/2011

Experiments to try to recreate conditions at the centre of the Earth are under way using X-ray beams and iron.

The ID24 beam line will allow scientists to subject iron and other elements to extremes of pressure and temperature, much like those at the centre of the Earth 19,000 miles below sea level. The main point of these experiments, based at the European Synchrotron Radiation Facility (ESRF), is to research into how the Earth's magnetic field came about and why the Earth's magnetic field can flip. The researchers will also be able to investigate how shockwaves from earthquakes travel through the near-centre of the Earth.

Using the Diamond Anvil Cell model of experiments, two microscopic samples are placed between the points of two specifically cut diamonds to create pressure which is many millions of times higher than usual at the surface of the Earth. Lasers are then used to heat the samples to more than 10,000°C. X-rays are then used to determine the shape and chemistry of the samples.

The samples will be analysed every millionth of a second using the higher resolution of X-rays than previously used in other similar but older instruments in Japan and the USA.



# Curiosity Leads NASA to Mars – 28/11/2011

NASA's most advanced rover ever has set off on its eight and a half month journey to our nearest neighbour in the solar system.

The project cost \$2.5 billion and the rover will scour the Martian surface for signs of present or past microbial life, for the equivalent of two Earth years. Curiosity was ejected from the Atlas flight 45 minutes after takeoff and started its journey to Mars at 21,600mph.

It weighs nearly 1 tonne and if it can land safely on the surface of Mars, it will be able to perform laboratory tests on the rocks and ground to determine the possibility of life now or ever. The landing will be tricky though and has been the source of failure of previous missions to Mars. NASA's newly designed rocket-powered descent system, is essentially a jet pack for the rover and will be able to position it near Gale Crater.

Gale Crater is located near the equator and contains a central three-mile high mountain. This spot has been chosen as it appears benign enough to have harboured life at some point, from satellite images.

Curiosity has a plutonium battery that will allow the electronics to be kept at a constant temperature for approximately 14 years, meaning that the mission is viable for a lot longer than the target two years.

# Physics

# Japanese Nuclear Conundrum – 14/03/2011

On Friday 11th March 2011, Japan was hit by the biggest earthquake in that area for over a century. Straddling three tectonic plates (Eurasian, Pacific and the Philippine plate) the Japanese have become accustomed to quakes with rigorous building regulations governing every house, office and public building.

However, the quake triggered a tsunami causing deep water to move at approximately 650mph, and putting the west coast of the U.S. and South America, thousands of miles away, on alert.

The north east of the two islands bore the brunt of the impact from the wall of water. Half the population of one town is missing, a passenger train is missing with over one hundred people on it and homes and agricultural land swept easily aside and flattened. Cars, trains, boats, lorries and houses float uncontrollably with the current and create further destruction as they take out bridges and other towns in their wake.

Footage and photographs of the destruction have been seen the world over and it is hard to comprehend the scale and fallout from such a disaster.

The focus of the world has adjusted slightly onto the nuclear power plant in Fukushima. Unconfirmed and unclear reports of fires and explosions at one of the reactors, added to unclear video footage made getting a clear idea of the situation hard. A hydrogen explosion had ripped through the outer wall and roof of the building housing reactor 1, but keeping the reactor itself whole.

The problem transpired to be that one of the reactors was overheating and background levels of radioactive caesium over 1000 times the normal background level outside the plant, indicating a leak. Cooling the reactor was the main concern. Overheating could lead to a meltdown situation that would rival the infamous Chernobyl Disaster 25 years ago. The solution would be to pump water into reactor to cool it, by they couldn't.

The authorities are now pumping sea water in to cool the reactor. This means the reactor cannot be used in future, but at the moment the primary concern is safety. Chernobyl claimed hundreds of lives instantly and thousands over the time due to radiation related diseases, such as cancer. The nuclear situation is far from over though. With an ever-increasing

exclusion diameter around the plant and more reactors over-heating, the disaster in Japan could have more far-reaching consequences across the world if the imminent nuclear crisis is not avoided.



Image: New York Times.

# Is Nuclear Power Worth The Dangers? – 18/03/2011

In light of the Fukushima nuclear crisis this week, I thought I'd write a blog about how nuclear power works, the pros and cons associated with it and question if the risks involved are worth the power we can obtain from it? Releasing energy from Uranium (the most commonly used fuel for nuclear power) depends on heat being created by nuclear fission. Neutrons bombard the Uranium nucleus which splits in half, releasing energy as heat. The heat is transferred away from the reactor by CO<sub>2</sub> or water. There was panic at Fukushima because the electrical supply which ran this cooling system failed and so the plant was on course for meltdown, which is when the core melts and releases radiation into the atmosphere.

The heat energy from the fission reaction heats water to produce steam, which drives steam turbines, and in turn, generators. These then feed the grid with power. Power made in this way accounts for roughly 11% of the world's energy demand.

To avoid runaway fission, the reactor is controlled using boron-rich control rods. These absorb neutrons, thus reducing the amount of fission occurring. The power can be increased by removing these control rods. Most modern plants use "enriched" Uranium. Natural Uranium consists of different isotopes; U-238 makes up the majority but is energetically useless. The rods go through an enrichment process to increase the relative concentrations of the energetically useful U-235 isotope.

2 billion metric tons of CO<sub>2</sub> would be produced if the equivalent amount fossil fuels were used instead of nuclear power each year (Nuclear Energy Institute). And despite being non-renewable like fossil fuels, nuclear fission is a much more energy efficient process than burning coal. It also costs roughly the same as coal.

The main disadvantages of using nuclear power are the price and safety issues when building a plant, and the disposal of waste. Waste needs to be buried in the ground for thousands of years in order to decay naturally, and while in that state it needs to be safe from everything from earthquakes to terrorists (who could use the radiation for weapons).

Nuclear power is an effective and useful alternative to fossil fuels and the infrastructure in Japan has allowed the nuclear crisis to be averted, for the time being at least. However, non-renewable sources of energy are coming to the end of their premiership and soon we will be able to stop weighing up the pros and cons of fossil fuels Vs. Nuclear power, etc and just embrace renewable fuels and start an energy revolution. The Fukushima crisis has brought into sharp focus the fact that despite the strict building regulations in Japan to minimise earthquake damage, it only takes a bigger than expected disaster to make the calculated safety of a power plant look unprepared and ill-thought out.

Source: <http://www.darvill.clara.net/altenerg/nuclear.htm>

# Faster than Lightspeed Travel by Neutrino Puts Einstein's Theory under Threat – 23/09/2011

One of the foundations of modern science has been that the speed of light has been the universal speed limit, but this could be under threat after CERN released new data which suggests that neutrinos can break this limit.

They presented their work on Friday and have understandably allowed other institutes to scrutinise their findings. Sixteen thousand experiments have been conducted and the data has fallen within the normal error margins, which could spell the end of almost a century of Einstein's Theory of Special Relativity dominance.

The subatomic neutrino made a 732km journey from Cern in Geneva to Gran Sasso underground in Italy sixty billionths of a second quicker than it would have if it were travelling at the speed of light. Neutrinos are known to switch spontaneously between the two types muon and tau and the Gran Sasso were detecting the tau type.

Antonio Ereditato, the report's author said that they had tried to find all possible explanations for the "crazy" results but could not find any suitable explanation, so they published them. They are still hopeful that other researchers will find inconsistencies with their findings so that the bedrock of physics isn't uprooted. However, the level of significance found by these experiments would be a formal discovery in any other scientific field.

Systematic errors at CERN are the only hope for Einstein's theory.

# Repeating the Faster than Light Experiments – 30/10/2011

The same scientist who last month reported that they had recorded a neutrino apparently travelling faster than the speed of light have fine-tuned their experiments in order to see if Einstein's theory of special relativity can be salvaged.

The neutrino arrived at the Gran Sasso lab in Italy after a 450 mile journey from Cern in Switzerland sixty billionths of a seconds earlier than it was expected to if it had been travelling at the speed of light in a vacuum. Understandably, this sent the physics world into a frenzy.

It meant that something could break the “universal speed limit”, the distinction between the past and future would be blurred, meaning that the strict relationship between cause and effect would change, wreaking havoc in the universe.

Instead of firing neutrino pulses lasting 10 microseconds, these experiments will send pulses for about 1 or 2 nanoseconds (thousands of times shorter) with large gaps between them. The gaps between the pulses will allow the researchers to measure more accurately the time taken.

The experiments are already being conducted and the new data is expected to be published by the end of the year.

# Neutrino Results Verified – 21/11/2011

The team that published the results of neutrinos breaking the “universal speed limit” (the speed of light) have confirmed that their findings were not caused by measurement errors after conducting a fine-tuned version of their experiments.

The team have submitted their findings for peer-review in the Journal of High Energy Physics, and await an academic “rubber stamp” to approve that their work was scientifically accurate and thorough. Instead of firing long beams of neutrinos from CERN, Switzerland, to Gran Sasso Lab, Italy 450 miles away, they fired shorter beams as it was thought this would remove any error in the measurements.

The neutrino, a sub-atomic particle, famously arrived in Italy 60 billionths of a second earlier than expected in September. This led to a deluge of articles, mostly online, about the validity of the finding and the future of physics.

One possible source of error could still be tiny discrepancies between the clocks at CERN and Gran Sasso. Albert Einstein’s theory of general relativity, states that clocks with more gravitational energy acting on them tick slower than those with less gravity (e.g. in space) acting on them.

Einstein’s theory of special relativity is still questionable based on the repeats of possibly the most important experiment of physics, and possibly science, in the last 100 years or more.



# Neutrino Findings Questioned – 22/11/2011

A team of researchers has cast doubt on the amazing CERN findings from September, which have been fine-tuned and repeated, that show the neutrino can travel faster than the speed of light.

The Icarus team state that because the neutrino didn't appear to lose any energy on their 450 mile journey from CERN in Switzerland to the Gran Sasso lab in Italy, that they must not have exceeded the universal speed limit.

Nobel Prize winning Physicist Prof Sheldon Glashow argue that if any particle were to travel faster than the speed of light, that particle should emit further particles thus losing energy as they slow to light speed. He has measured the energy of neutrinos are consistent with slower-than-light-speed travel.

This controversial area is going to be the subject of many experiments and papers in the near future until the matter, excuse the pun, is settled once and for all.

# Google Celebrate Marie Curie with Doodle – 07/11/2011

Marie Curie is most famous for discovering Radium and Polonium (named after her native Poland) and winning two Nobel prizes.

She and her husband Pierre discovered the two elements and received the Nobel Prize for physics in 1903, sharing it with Henri Becquerel (who discovered radioactivity).

During the First World War, she helped to develop smaller, more portable X-ray machines to help with triage on the frontline to help locate bullets and shrapnel. She was also director of the Red Cross radiological service and held training sessions to teach orderlies and doctors how to use the new technology.

She went on to win her second Nobel Prize (in Chemistry) in 1911 before dying of pernicious anaemia in 1934. Her disease was caused by massive over-exposure to the radiation she helped to define and utilise for therapeutic use.

X-rays and the use of radiation has saved millions of lives around the world since the early 20<sup>th</sup> century and Marie Curie is the one to thank.

# Ten Weirdest Science Experiments Ever

# Ten Weirdest Science Experiments Ever; Number Ten; Turkey Arousal Experiment

In the 1960s, Martin Schein and Edgar Hale from the University of Pennsylvania were intrigued by the sex lives of turkeys. They discovered that faced with a model of a female turkey, the male would still let out its amorous gobble and try and mate with it.

They then wondered how little of a resemblance the male would need in order to be aroused. This meant removing body parts of a dead female and placing it in front of the male. Who continued to be aroused until all that remained was a female's head on a stick.

Schein and Hale continued by trying to determine how little likeness the male needed to elicit a response and found that a freshly severed head was the most effective. They continued their research into other poultry sexual behaviour in the following years.

# Ten Weirdest Science Experiments Ever; Number Nine; Chimp Raised by Humans

Having studied the effects on children that had been raised by animals, psychologist Winthrop Kellogg wanted to determine what the effects on an animal raised by humans would be.

In the cases he had studied, the child acted more animal-like even after being returned to human society. He therefore wondered if an animal was raised by humans, as a human child, would act human in time. In 1931, he brought Gua home, a seven month old chimpanzee and was raised as a human child alongside Kellogg's son Donald (ten months old at the time).

Kellogg subjected them to tests to determine their development, included the suspended cookie test to see how long it would take for Gua and Donald to take a cookie suspended on a piece of string in the middle of a room. Strangely, Gua performed better on the tests.

Donald's language skills were below average for his age nine months into the experiment. Worryingly for the Kellogg's, Donald started to imitate Gua's "food bark" when he was hungry. At this point Kellogg decided to stop the experiment and shipped Gua back to the primate centre.

# Ten Weirdest Science Experiments Ever;

## Number Eight; Vacanti Ear Mouse

One of the iconic images of the 1990s was of a completely hairless mouse with a human ear on its back. Animal protesters used it as the spearhead of their campaign against genetic engineering. Their campaign was loud but also misguided because there was no genetic engineering involved.

The protesters thought the mouse's genetics had been altered in a laboratory to enable it to grow the human ear of its own accord. This was completely wrong. The ear contained no human cells at all.

The human ear is a complicated part of the body and is made of cartilage, which is hard to reconstruct and repair. Charles Vacanti first grew human cartilage on a biodegradable scaffold in 1989, but it wasn't until 1997 when his brother, Joseph Vacanti published his work on creating a replica of a 3 year olds ear. He wrote that he was able to make the scaffold into the exact shape of the ear, and therefore cause the cartilage (originally from the knee of a cow) to grow in the shape of an ear.

The mouse in the infamous photo was a "nude mouse". These were the fallout from an experiment in the 1960s with mice genetics which caused the mice to be hairless and without an immune system. Lacking an immune system meant that the ear could be grafted onto the back of the mouse and avoid tissue rejection of the cow cartilage cells by the mouse. After three months, the ear was supplemented with blood vessels from the mouse and the scaffold dissolved, leaving the ear supporting itself.

This technology was never put into use with humans because the immune system would instantly reject cow cartilage cells. However, one man's cartilage provided the starting point of a chest plate for himself after he was born with Poland Syndrome, a disorder of the cartilage, which in his case meant he had little or no protection around his heart and lungs. Using his own cells meant that the problem of tissue rejection was avoided and meant the man had protection of his heart and lungs.

# Ten Weirdest Science Experiments Ever; Number Seven; Electrodes Used To Initiate Heterosexual Behaviour in a Homosexual Man

James Olds and Peter Milner discovered that the septal region of the brain is involved in pleasure sensations in 1954. They demonstrated this by inserting wires into that region of a rat's brain and placing it in a cage with a lever. The lever caused the wires to electrically stimulate the septal region and resulted in the rat experiencing intense pleasure. Once the rat learned that pressing the lever lead to such sensations, it would press the lever up to 2000 times an hour.

It wasn't until 1970 until Robert Heath thought of a novel use for Olds and Milner's discovery. He decided to try and change a homosexual man into a heterosexual one. He inserted electrodes into the septal region of his subject's brain and gave him controlled doses of stimulation. Heath then allowed the subject (only known as B-19) to stimulate himself. As with the rat, soon B-19 became almost addicted to pressing the button and in a three hour stretch reportedly pressed it 1500 times. At this point he had to be disconnected as he was "experiencing overwhelming euphoria and elation".

Remarkably, he continued with his experiment and, with permission from the state attorney general, was allowed to introduce B-19 to a 21 year old female prostitute. After an hour of nothing, the prostitute took the initiative and Heath got his positive result. Heath later reported that after reintroduction to society, B-19 went on to have an affair with a married woman as well as being a homosexual prostitute as well. Heath never repeated the experiment but decided that the treatment was partially successful.

# Ten Weirdest Science Experiments Ever;

## Number Six; The Schmidt Pain Index

In the 1980s, Justin Schmidt decided that there needed to be a scale for the pain caused by stinging and biting insects. He and his team tested 76 insects' bites/stings **on themselves**, and rated them on what has now been called the "Schmidt Pain Index". Below is the description of each pain scale rating, including the phrases used by Schmidt and his team. Despite using a number to represent each pain level, the team also included descriptive language in the index. The experience of pain is different for everyone, much like the taste of a wine, and the language used reminds me of a wine taster, bringing words like "fruity" and "smoky" into science research.

A pain scale rating of 0 represents a bite/sting that cannot penetrate human skin.

A pain scale rating of 1.0 is a pain that lasts less than 2 minutes and could be experienced from the sting of a sweat bee. The experience is described as: "Light, ephemeral, almost fruity. As if a tiny spark has singed a single hair on your arm."

1.2 is a 2-5 minute pain caused by, for example, the fire ant. Schmidt describes it as: "Sharp, sudden, mildly alarming. Like walking across a shag carpet & reaching for the light switch".

1.8 is a slightly longer lasting pain which can be caused by the Bullhorn Acacia ant. The bite is "A rare, piercing, elevated sort of pain. Someone has fired a staple into your cheek".

A honeybee, yellowjacket or bald faced hornet sting has a rating of 2.0 and can last between 3 and 10 minutes. It is said to be "Hot and smoky, almost irreverent. Imagine W. C. Fields extinguishing a cigar on your tongue. Like a match head that flips off and burns on your skin. Rich, hearty, slightly crunchy. Similar to getting your hand mashed in a revolving door".

The sting from the paper wasp or the bite of a red harvester ant can last anything from 5 minutes to 8 hours. Schmidt described it as: "Bold and unrelenting. Somebody is using a drill to excavate your ingrown toenail. Caustic & burning. Distinctly bitter aftertaste. Like spilling a beaker of hydrochloric acid on a paper cut".

A tarantula hawk wasp, which looks and sounds like a formidable insect, has a sting rating of 4.0 and lasts usually 3 minutes. It is "Blinding,



fierce, shockingly electric. A running hair drier has been dropped into your bubble bath”.

Finally, a bullet ant was described as having a bite rating of 4.0+, the highest of any insect tested. The description is as follows: “Pure, intense, brilliant pain. Like fire-walking over flaming charcoal with a 3-inch rusty nail in your heel”.



Image: (<http://tinyurl.com/6f5lb2u>)

Source:

[http://insects.about.com/od/antsbeeswasps/tp/schmidt\\_sting\\_index.htm](http://insects.about.com/od/antsbeeswasps/tp/schmidt_sting_index.htm)

# Ten Weirdest Science Experiments Ever; Number Five; Drinking Bacteria to Prove A Theory

In 1982, Robin Warren and Barry Marshall, two Australian researchers discovered *Helicobacter pylori* in the stomachs of humans. This was only after many failed attempts to culture the bacteria, when they left it in the lab over a long weekend and came back to find that it had grown.

Marshall noted that *H. pylori* are found in approximately 50% of patients with stomach and intestinal ulcers and that inflammation is always seen in the stomach lining of patients with these ulcers. Until then, *H. pylori* was considered inert and not to cause stomach and intestinal ulcers. The main risk factors until then had been stress and lifestyle.

Eager to prove his theory that *H. pylori* was the cause of these ulcers and that lifestyle and diet was not the cause, Marshall infected himself by eating a petri dish containing colonies of the bacteria. Having never suffered from them before, he soon became nauseous and after a few days it was confirmed that he had stomach ulcers.

Instead of surgery, the standard treatment at the time, he administered antibiotics, which he knew killed the bacteria in the lab, and was treated effectively.

Dr Marshall went on to win the Nobel Prize for his work and claims that his discovery is still saving 500,000 lives a year.

# Ten Weirdest Science Experiments Ever; Number Four; Semen Makes Women Less Depressed

In 1986, Dr Ney found that absorption of prostaglandins and other hormones can be absorbed through the vagina cells. Semen contains many mood altering hormones including testosterone, oestrogen, various prostaglandins, FSH, LH, and prolactin, and so the absorption of them would initiate an effect on the woman's mood.

Dr Gordon Gallup was intrigued by Nye's findings and divided 293 female undergraduate students into groups depending on how often their male partner used a condom when they were having sex. Gallup and his team used the Beck Depression Inventory, which is the standard questionnaire used to determine mood. A score of over 17 indicates a depressed person.

The females whose partners never wore a condom scored 8, occasionally used condoms 10.5, usually wore a condom 15, and those who always wore one 11.3. For comparison, those undergraduates that weren't having sex scored 13.5.

Interestingly, the students whose partners never or sometimes wore a condom got increasingly depressed the longer the gap got between last having sex. The time gap had no effect on those whose partners usually or always wore a condom though. Suicide attempts were also more common among women who used a condom.

Gallup then extended his testing to include an additional 700 females to the sample. The findings of this second group conformed to the results from the first tests.

Having accounted for the strength of relationships, those who took oral contraception (therefore less nervous about unplanned pregnancy), and personality variations (differences in personalities, and therefore mood, would cause different individuals to use/not use a condom), Gallup and his team ruled out every cause for the difference in mood except semen. Levels of the hormones in semen can be detected hours later in the woman's blood, caused by the exposure to semen.

An evolutionary psychologist disputed the importance of hormone absorption in the vagina saying it made no evolutionary sense. However

Gallup argues that men who have semen that cause a long-term mood improvement stood a better chance of reproducing.



Image: <http://tinyurl.com/5u53lwq>

Source: <http://www.newscientist.com/article/dn2457-semen-acts-as-an-antidepressant.html>

# Ten Weirdest Science Experiments Ever;

## Number Three; Spiders on Drugs

NASA scientists wanted to determine the effects of psychotropic drugs on spiders. Their thinking behind this was that new drugs could be tested on spiders to determine their toxicity. A spider on drugs, such as LSD and caffeine, produces more disorganised webs the more toxic a drug is.

The image below shows the webs from spiders on different drugs. Spiders on marijuana seemed to lose concentration half way through spinning their web. When on Speed (Benzedrine), spiders left large holes in their webs. When administered sleeping tablets, predictably, the spiders fell asleep before they had chance to finish. Most interestingly, when the spiders were given caffeine, one of the most popular legal drugs in the world, they produced just a few random strands incapable of catching any flies.

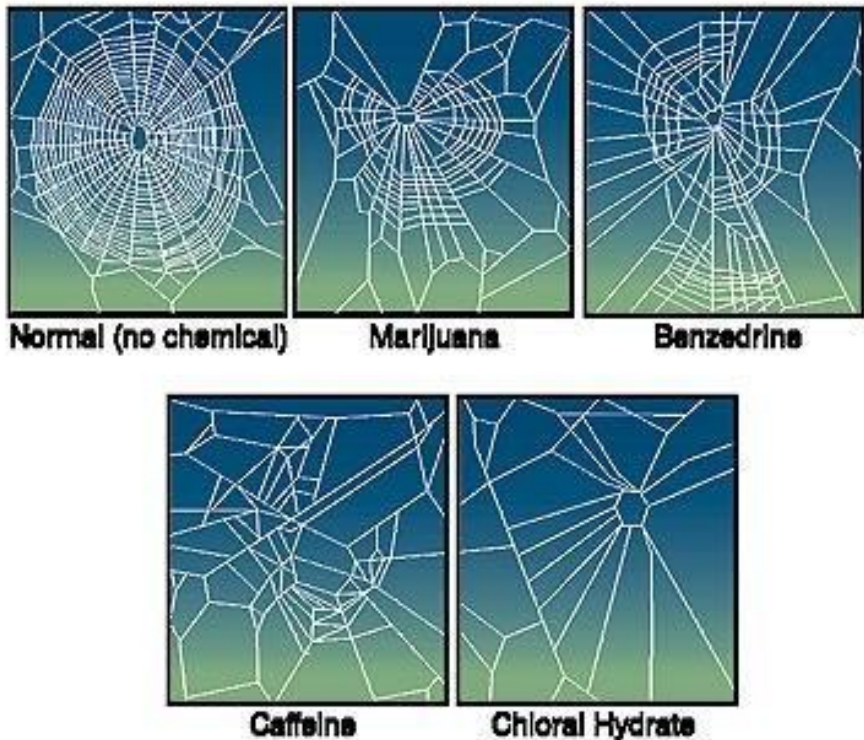


Image (<http://tinyurl.com/37ee8pw>)

Source: <http://www.trinity.edu/jdunn/spiderdrugs.htm>

# Ten Weirdest Science Experiments Ever;

## Number Two; Duchenne Smile

In 1862, Duchenne de Boulougne, a leading neurophysiologist and innovative photographer, published his book: *The Mechanism of Human Facial Expression*. This small book provided the foundations for much research in the decades that followed. Darwin even cited some of Duchenne's work.

Duchenne was interested in physiognomy; determining the personality or character of a person by their outward appearance, particularly by their face. He believed that the face was the gateway to the soul of a man, and disputed the popular idea that the face was able to express moral character. Instead, he wanted to document "idealised naturalism" on the recently invented camera.

He picked his subjects, one of which is the infamous "old man", who had an anaesthetic condition of the face.

This proved useful when Duchenne placed electrodes on the man's face and passed a current through them to stimulate different muscle groups. He then photographed the expression portrayed by each stimulation and compared them. He tested many different muscle groups, some with alarming results as the photographs prove.

He was able to experiment on 6 live patients, but the old man was used most regularly as his condition enabled him to be tested repeatedly without enduring pain.

Through these experiments, Duchenne was able to define the core expression of humans and state that each was associated with a specific muscle group. He also concluded that the thirteen basic emotions could be controlled by two muscles.



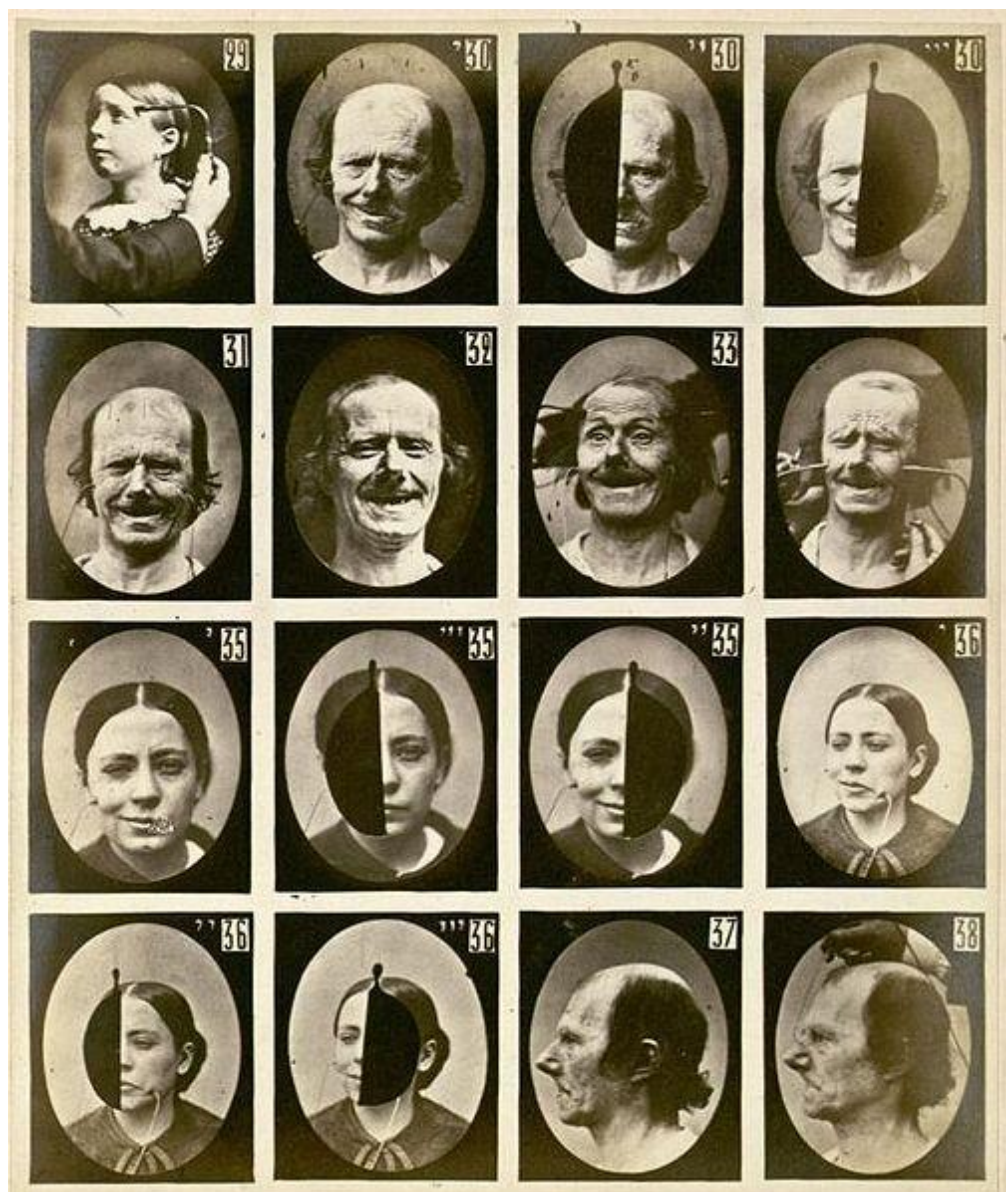


Image: Public Domain

Source: (*The Mechanism of Human Facial Expression*)

# Ten Weirdest Science Experiments Ever; Number One; Elephants on LSD

Warren Thomas of City Zoo in Oklahoma accompanied by West and Pierce of University of Oklahoma Medical School wanted to determine if LSD could induce musth in an elephant. Musth is a temporary condition some male elephants experience, in which they become very aggressive and secrete fluid from the temporal lobe in their brain.

Thomas loaded a cartridge syringe with 297 milligrams of LSD, approximately 3000 times the average human dose and fired it at Tusko the elephant. Tusko reacted immediately and made loud calls for a few minutes before collapsing. The researchers tried to revive Tusko, but they failed and he was confirmed dead an hour later.

However, some were unconvinced with the assumption that Tusko had died from the LSD and suspected the drugs used to try and save him could have killed him. The debate and controversy grew until twenty years later when Ronald Siegel from UCLA gave two elephants similar doses to that given to Tusko. Instead of firing a cartridge syringe at them, he mixed the dose into their water. The elephants reacted but in a completely different way to Tusko. They were sluggish, made strange squeaks and chirps, and were seen rocking backwards and forwards but they survived and within a few hours they were acting normally again.

Despite the experiments having not killed these two elephants, Siegel thought that maybe the dose given to Tusko had exceeded a toxicity threshold. Therefore, he still couldn't say whether the LSD or the attempts to save Tusko had killed him.

This is the strangest science experiment in my opinion because in the others that make up this list, there is some kind of reasoning behind the testing. Some strange questions were answered and despite the ethical questions raised about sticking electrodes on a man's face or trying to "cure" a man of homosexuality, there have been some truly inspired experiment design. Administering a huge dose of LSD to an elephant to see if a rare and temporary experience of madness is induced however is the strangest of all because the reasoning is so shallow. You can't help but think that they just did it out of curiosity more than anything else, and that's why it is number one.

Source: <http://www.museumofhoaxes.com/hoax/top/experiments/>



# Opinion

# Should We Bother Saving the Panda?

06/12/2011

As two pandas start a life in Edinburgh, I have been wondering whether it is worth all the effort to save pandas.

Firstly, female pandas are in heat for just two days a year and the males suffer from low libido. Put together with the fact that they have evolved to eat bamboo, and therefore have to eat 38kg a day, taking up 14 hours, leaves them little time to reproduce. Currently, one offspring is expected from a pair every two years. After using Viagra to help the males, captive breeding programs now use frozen sperm and artificial insemination between zoos to help increase the numbers of Giant Pandas, currently at about 1,800 (wild and in captivity).

International law protects the pandas from poaching but the fur is still a prized haul and hunting still occurs in the mountain regions of China where the pandas live naturally.

On the other hand, every living thing on Earth is subject to natural selection. In the past, bamboo was probably a wise food choice because of its relevant abundance. But with bamboo deforestation increasing in their natural habitat, and the low nutritional value of it, a strong selective pressure has been put on the Giant Pandas to either adapt or die.

From an evolutionary viewpoint, an increased reproduction window/rate, or a change in dietary habits could pull the Giant Panda away from the brink of extinction, but this takes hundreds of generations to create any measurable improvement.

Is the money spent by WWF and similar organisations wasted on the panda? To a certain extent, I think they are. If a couple of reproductive age are together in captivity and need human intervention to enable them to reproduce, they are clearly not fit to survive and there is a strong argument for leaving them to their own fate.

Pandas are the symbol of the WWF and to some extent China's commitments, on the international stage, to wildlife preservation and for political reasons, more than biological reasons; I believe that unrepresentative amounts of money will be spent on these biologically obsolete animals.

# Science's Public Image/Elitism and Science Research – 27/04/2011

When I tell people I am a researcher in microbial genetics, they often raise an eyebrow and say something like “That must be interesting.” when they are actually thinking something along the lines of “What’s the point in that?”

The importance of other jobs that require qualifications is much easier for the public to understand. An accountant, a doctor, a lawyer, a plumber all require qualifications, but will rarely be asked to explain their job. The majority of the public have a kind of prejudice about science research in obscure fields such as microbial genetics. Unless there is an easy path in their mind between what is being researched and a practical application for it, such as cancer research or drug development, they lose interest fairly quickly. There is this assumption that unless a researcher cures a disease or devises a new diagnostic/prognostic test for a disease, that they are just “messing around” or “playing God”. This is especially true of genetic engineering and microbiology, where the layperson assumes that researchers are just feeding their curiosity by “seeing what happens when...”

For this reason, science is still considered to be an elitist field where there is a huge gulf between their work and its importance in the real world. This simply is not the case.

Science affects everyone. Therapy development, environmental research, genetic discoveries and increasing the understanding of disease pathologies are a few of the many areas in which scientific research directly affects every single person on this planet.

If the person you’re talking to hasn’t walked away after introducing yourself as a scientific researcher, trying to justify your work can seem contrived and insignificant in the bigger picture. For example, if a biochemist works on a particular protein, that protein could be one of many in a pathway, of which the pathway is one of a handful that can occur when a person has a particular disease. Saying that you work on one protein can seem like your work is insignificant without using frames of references that they may not understand. Conversely, saying that you are an Alzheimer’s researcher (using a reference that they are more likely to understand) before explaining that you work on one protein can *still* make your role seem insignificant.

The truth is that research is a slow process, and despite putting in all the groundwork, the predicted result is still not guaranteed. Even if a result is collected, the work to prove it has only just begun. Double checking results, running controls and ruling out all other possibilities can take years. Bearing in mind that this research may be just to prove/disprove a small part of one theory. The truth of the matter is that collaboration between institutes in the UK and internationally is needed to connect individual projects on small parts of the same problem, to make concrete conclusions about the bigger picture. Without working together, science becomes (more of) a competition to see which lab can come up with the answer first instead of working together for the common good. The secretive nature of some research only adds to the public perception of elitism in science.

If the person you're talking to *did* walk away, they may be thinking that this "messaging about" seems a bit useless and expensive in a time when the country has no money. Nearly every area of government spending was hit hard by the budget, but science funding (in cash terms) didn't reduce. The problem is though that research (in any area) is not short-term, and requires substantial amounts of money to maintain it. The age of science and technology has overtaken the age of industry in Britain, and we are truly world leaders. The list of notable British scientists is extensive and impressive. If we are to maintain this reputation for excellence in science, the funding needs to be available for research to continue even in the financially tough times we are faced with. Breakthroughs and discoveries do not happen overnight, they are an accumulation of years of work and incremental advances in knowledge based on small projects from all around the world. For the bigger picture, seemingly insignificant projects are integral to the long-term aims.

I am well aware that this piece of writing will probably be preaching to the converted. If you are reading this, you are probably already interested in science and will probably understand its influence and importance in every aspect of everyone's life. However, it is my belief that convincing people who *aren't* interested in science that seemingly irrelevant research is key in the grander scheme of things, is essential. Making science more accessible and understandable to the masses is vital to take science out of the elitist, God-playing, curiosity-feeding, obscure public-image rut that it has found itself in.

Thank you for reading this ebook.

My blog is available at

<http://thomasdickinson.tumblr.com>

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